THE IRON TRADE REVIEW

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THE IRON TRADE REVIEW.

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CLEVELAND, O., OCTOBER 3. 1889.

THE WEEK IN IRON CIRCLES.

General Features. The significant features of the iron market are: first, the unprecedent reduction in stocks during August, just now reported, and, second, the persistent increase of new work going into foundries and mills. These facts form the foundation for a bullish feeling on all hands. Quite naturally, the tendency of prices is to further advance. Orders for new cars are being placed almost every week, and these call for large quantities of bar iron, car wheel iron and low grades of foundry iron. Architectural works are pushed, as are also jobbing foundries, and those making mining and general machinery. There are few furnaces seeking buyers. Those in the South and in the Northwest are heavily oversold. Ohio furnaces can still take orders, but they claim they want enough advance to cover the heavy increase in cost of coke, ore, freights, etc. Lake Superior charcoal iron is well sold up; prices are firmer, with a tendency to higher figures. No important change can be noted in the Detroit market during the past week, although it might be said that in certain spots it was found to be a trifle weak. However, this does not refer to general trade, but to particularly large orders for unusual grades. October 1st can be said to be even better than it was September 1st. Lake Superior charcoal iron has been less active during the past week, although stray lots are being sought for by certain buyers to complete their mixtures. Old rails have been in considerable demand at strong figures. The past week has witnessed a still further stiffening of prices at St. Louis, and business continues good at the advance. Southern charcoal irons have sold freely and Ohio softeners are being called for. At Cincinnati the aggregate of small orders is strong and firm, but without any change. Ohio irons have moved up some; Lake Superior charcoal brands have also felt the influence perceptibly. Old material of every kind is active and strong. Mill irons are very scarce. Few Southern furnaces have anything to quote for early delivery, and none are willing to trade for next year's deliveries, unless at still higher prices. The market at Pittsburgh continues fully as strong as at date of last report and the only change is in the direction of higher prices. Toward the close of last week, mill iron sold about 25 cents per ton higher that it had touched previously, a few lots being placed at $16 cash. At Louisville the market has been quiet during the past week with few transactions. Buyers for delivery this year have largely contracted for what iron they will need, and, as furnaces are unwilling to sell freely for delivery extending over more than 90 days, but few sales have been made. Railroad companies throughout the South report the amount of freight offered is unusual, and frequently there is a demand for 300 to 400 cars a day in excess of the supply. A careful canvass of Southern furnaces shows that for delivery during the next 60 days there is a scarcity of mill irons.

Iron Ore. As the season advances, it becomes more and more clear that this year's output of Lake Superior ore will far exceed the most sanguine estimates made at an earlier date, and it is only a question of the maintenance of an open waterway, together with the producing facilities at the mines, as to how far this season's output shall exceed that of last year. In the face of the very liberal sales made this year, and notwithstanding the receipts by Central Pennsylvania furnaces of large quantities of imported ores, there is an unaccountable demand for Lake Superior ores, at this time, and a quarter of a million tons of good Bessemer ores would be snapped up in a very few hours. A few sales are reported of odds and ends, such as 5,000 tons of Chapin to go by rail, and at a price equaling $4.80 in Cleveland. The most peculiar feature of the market, however, is found in the inquiry by the furnace interests, generally, as to the price of ore for 1890 delivery at lake ports. The ore dealers are, of course, in no position to make even approximate prices for next year's delivery, and it is doubtful whether they would be willing to establish a price at this time, even had they the means at hand to make it. The situation is one that forces upon any prudent furnace-man the necessity of making timely provision for his ore supply during the next season, and while the matter is held in abeyance by the ore interests generally, the indications, at this early day, point to the opening of the new ore market at a time not far removed from the close of this year's navigation. Charters are strong, with an upward tendency. Escanaba freights are scarce at $1.10, with Marquette at $1.25, while $1.40 is charged for cargoes from the head of Lake Superior. Coke has experienced an advance of 15 cents, and is now sold at the ovens at $1.50, with another advance of 25 cents in view by the 1st prox.

Pig Iron. The very strong condition of the market, and the good things yet expected, have given rise to the fear that the present large and wholesome demand for all classes of pig metal may induce a sudden inflation in prices, that must necessarily end disastrously for all parties concerned. Whatever may be the experience of others, the manufacturers of pig iron can ill afford a boom. Another advance of a dollar or two will not only call into blast dozens of stacks now idle because of improper location or want of economic management, but will throw open the doors wide to the makers of Southern iron, who will profit by the advance much longer because of the strength it is sure to give them later on, when again ready to swamp this and adjacent markets with cheap and inferior iron. There does not seem to be at this time any special call for an advance in pig material, as everybody concerned in its manufacture, beginning with the mine interests, is getting a fair return at the present rate of iron. Charcoal irons are worth about $20.50, and Bessemers hover about in the vicinity of $18.50, sharp cash and immediate delivery. With the same conditions, all-ore foundry irons sell at the furnace at $17.50 for No. 1—which makes the price here $18.30—and at $16.50 for No. 2, while a prime quality of mill brings $16. Cinder mixtures average one dollar less all around. All this is for spot delivery, and the inquiries for future delivery are quite sharp. Very few concessions, however, are made to buyers, most furnace-men either declining to engage their product for any considerable period ahead, or asking enough of an advance to keep up with the procession in the advent of the next raise. The stocks are being rapidly reduced, while the consumption of pig iron is on the increase, more particularly in Bessemer iron, which is expected to lead in the advance.

Merchant Iron. It is from Chicago that a Cleveland mill man has received the prediction that within three months steel rails will sell at $40. Rails, it is true, have gone up $3 during the past three weeks, but the wisdom of another material advance is seriously to be questioned. In the meantime, the makers of bar iron are the only complainants. With muck bar at $28.50 or $29 they are selling bar iron at $34. Old rails bring $26, and since $10 above that figure is claimed to be necessary for the profitable production of bar iron, it is plain that the present profit margin is so small as to be hardly visible to the naked eye. The mill men in the valley are blamed for the low prices of bar iron. In other respects the market is good, and prices are firm.

Hardware. The market is strong in all the lines. Metals, except copper, are firm. Heavy hardware is moving in large quantities, and cut nails are high, being twenty-five cents above the base price.

THE NATURAL GAS INDUSTRY.

It requires no close reading or investigation to convince one that the natural gas industry of Pennsylvania and Ohio is in a bad way. Its rise was sudden, its profits have been enormous, its effects upon manufactures have been noteworthy, and its end seems a matter of the not very distant future. In the first place, despite the positive theories of paid experts, the supply has proven very unreliable. Indeed, the history of the oil industry would naturally lead to this conclusion, with this very important addition: that whereas there is a market for oil all over the world, the market for natural gas is limited to the end of the supply pipe. It will, therefore, be readily seen that, if to the uncertainty of the supply is added the limited area of the market, the chances of collapse of the natural gas industry are multiplied tenfold. Indeed, many of the companies already appear to see the handwriting on the wall, for there has been a marked falling off in supply, with a corresponding advance in price, not only in Pittsburgh and surrounding towns, but also in Northwestern Ohio. At New Brighton, Pa., the Citizens Gas Company has fixed the rates for the month of October for $2.50 for each stove, and $2 for grates. They are making contracts for one month only, and will give no yearly rates. This is a large advance over the old rates. The Pennsylvania fields, which have been furnishing Youngstown, have become so much reduced as to render it impossible for the company operating them to fill its contracts, and it is said that natural gas for Youngstown will be a thing of history by January 1. At Washington and Beaver, Pa., a decided shortage is also experienced, and some manufacturers have gone back to the use of other fuels. No less authority than Dr. J. S. Newberry, Professor in the School of Mines, Columbia College, New York city, gives the opinion that "every gas well will have a limited time of service, and the great gas reservoirs will be exhausted with a rapidity proportioned to the number of wells sunk." Another competent authority, J. C. White, Professor of Geology in the University of West Virginia, freely asserts that "it will be only a year or two until the natural gas fields from which Pittsburgh companies now draw their supplies of fuel are exhausted." "The Bellevernon field," he adds, "upon which everybody is now building up hope, is shallow and will not stand the drain, even though it is now as promising as any field yet discovered." And precisely the same conditions obtain in Northwestern Ohio.

The second source of weakness is the speculative element which has obtained ascendancy in the management of the natural gas business. In dealing with an element so uncertain in its locality and its supply, the hazards of the business are increased many-fold; and when we add to this the complications, legislative and financial, arising out of the municipal purveying of this commodity, the situation is in nowise improved. Writing upon these phases of the question, in the New York *Financial and Mining Record*, Mr. Charles Harrison, evidently a very keen and intelligent observer, says:

Natural gas companies organized and doing business in Western Pennsylvania, have issued bonds, but they have been placed through private agencies on private terms, so that very little is publicly known of the value that has been placed upon them.

It may be said, however, that the validity has never been questioned seriously; the companies issuing them have been regular dividend paying institutions, as a rule, hence of good credit. Each company have mortgaged a plant, costing far more than the face value of the bonds, to secure the payment, and so long as there is a supply of gas the collateral is probably unquestionable.

But from the exhaustibility of the wells from which supplies are obtained, the comparative worthlessness of a pipe line having nothing to fill it with; the constantly increasing expenditures of established companies, more particularly pointed out above, the general rule that the longer a bond has to run the more valuable it is, does not necessarily apply to natural gas securities.

Besides these considerations, the risks of the business are so great, and its speculative character so pronounced, a high rate of interest becomes essential to indemnify against the contingencies of the investment. The securities issued by a corporation partake, to some extent at least, of the speculative character of the business in which it is engaged.

In Northwestern Ohio, widely different conditions exist from those in Western Pennsylvania. There, municipalities have engaged in the natural gas business, issued bonds to enable them to construct and operate natural gas plants, and, like other municipal securities, are accompanied by no tangible collateral whatever, but are based entirely on the public credit. In the way of bond issuing these afford the most interesting financial considerations in connection with the natural gas industry.

The exhaustibility of supply and constant search for new territory, applies there as elsewhere. The business risks and expenses of a municipality are at least as great as those of a business corporation and are liable to be much more. Natural gas trustees are generally gentlemen of success in their vocations, but without practical knowledge of the details of production or distribution of natural gas.

Practical affairs inevitably become more risky under inexperienced management than under the direction of experienced men. Bonds issued by a municipality under such management and having nothing but public credit behind them, cannot be so desirable as those issued by business corporations, whose affairs are conducted by persons of experience in every department, and which give collateral on their tangible plants, as well as the security of experience and actually invested capital.

Municipalities invest no capital in their natural gas plants. The capital is borrowed on bonds sold. They have been uniformly induced by a class of persons who desire to "boom a town;" who desire to induce manufacturers to locate in the city or in the suburbs under the proclaimed advantages of "free gas," or "cheap fuel" at least, provided largely at public expense. To borrow money wherewith to erect a charitable institution, or one to be conducted without profit, cannot enhance the value of bonds upon which such capital is borrowed.

Experiment has shown in a number of cases the effects of municipalities entering upon the natural gas business. Besides the creation of a bonded indebtedness for the construction of the plant and setting it in operation, the expense of operating has caused a deficit to be supplied by taxation. At first, prices to consumers are reduced so that business corporations are forced out of business and the price is then advanced often to twice the rates charged by the business concerns. Excitement has run riot for a time, values of real estate advanced and tracts have been unloaded at high prices at favorable terms to taking it back on the mortgage. Manufacturers have been led to locate there merely to find the gilded promises but empty bubbles from the natural cause of failure to supply. Cities claiming to have "gas enough for all the world" a couple of years ago, were chilly last winter for want of fuel, and councils are called upon for further appropriations for funds to put the plants in order for the coming winter.

No denial is attempted to the assertion that, in many cases, the bonding has been without authority of law, and out of this arises a whole train of problems as to the legitimate end of the assumption of such authority on the part of municipalities. What constitutes a public use? If the furnishing of fuel be a public duty or use, municipalities may be permitted to borrow money, issue bonds therefor, and purchase coal lands, provide for transportation and distribution of coal to the citizens, conduct a coal business—but without profit—and tax all other coal dealers to supply its deficiencies arising from lack of paying expenses otherwise. If it be a public use to provide fuel for heat in winter, why not ice to keep the people cool in summer? If it be a public use to supply the people with fuel, why not with clothing, shelter and food? Already the court calendars have become crowded with litigation growing out of such complications as these, and the end is not yet.

Taken in any aspect of the case, therefore, the outlook for the natural gas industry is by no means encouraging. Thus far the most practical solution of the problem seems to be in the direction of cheapening processes of fuel gas manufacture and the elimination of the municipal management idea; and that, we are inclined to think, will come more speedily than many imagine.

CANADIAN IRON ORE AND NEW ENGLAND FURNACES.

Concerning the specious, but wholly fallacious claim of some New England iron manufacturers, that, with the duty on iron and coal removed they would be able to regain their prestige by obtaining their "raw material" in Nova Scotia, Mr. A. Evans, Jr., who held a year or more ago a responsible position under the Londonderry Iron Company, of Londonderry, Nova Scotia, but who is at present general manager of the blast furnace of the Detroit Iron Furnace Company, at Hamtramck, near Detroit, and of the blast furnace of the Newberry Furnace Company, at Newberry, Mich., writes as follows to the *Bulletin* of the American Iron and Steel Association:

I spent nearly three months of the Summer of 1888 in the provinces of New Brunswick and Nova Scotia, and was part of that time in charge of the blast furnaces of the Londonderry Iron Company, at Acadia Mines, Nova Scotia. I did not find a single furnace in blast in either of these provinces, except one of the two stacks of the Londonderry Iron Company, and this furnace the company was only enabled to run on account of having a demand for the larger part of the iron at its own works, which consist of a pipe foundry, a rolling mill and an axle forge. As the Londonderry Iron Company could not successfully compete in the open market with imported pig iron, even with the $4 of protection, and $1 50 of bounty at that time allowed by the Canadian Government, it built its pipe foundry under an especial concession, the government giving the company, if my memory serves me correctly, $12 per ton on pipe, as an inducement to start a foundry of that description in Nova Scotia.

Another reason for the company not running its idle stack, even if its own necessities required the pig iron, was that it was hard pushed to procure enough iron ore for the furnace then running, although Mr. John Sutcliffe, the general manager of the company, had traveled all over the province endeavoring to secure an additional supply. Indeed, while I was there, Mr. Sutcliffe took a two weeks' trip to Newfoundland in search of a supply of iron ore from that country, but failed to secure it. The ore the company was using would not have been used by any furnace in this country, as you will see from the analyses given below, which were taken from a lot of ore of better quality than the average output of the mines. The following analysis of a specimen of

calcareous limonite ore, taken from the Totten mine, at Londonderry, will give a very fair idea of the richness of the ores the company was using:

	Per cent.
Insoluble matter	5.48
Ferric oxide	54.18
Ferrous oxide	2.31
Alumina	2.81
Manganese	1.35
Lime	22.80
Magnesia	4.40
Average metallic iron	31.00

An analysis of a specimen of limonite ore, called hematite, taken from the West mine, gave the following results:

	Per cent.
Silica	16.00
Alumina	0.85
Magnesia	0.46
Phosphoric acid	0.57
Metallic iron	40.00

The coal received for the manufacture of coke was very poor, and all of it contained a great deal of slate, although the miners declared that they had taken especial care in its preparation and loading. The analyses given below were made from coke manufactured from the best coal received, we rejecting as high as twenty car loads in a single month as totally unfit for coking purposes. The coke made from coal taken from the west slope of the Spring Hill Company analyzed as follows:

	Per cent.
Ash	19.48
Sulphur	1.01

A sample of coke made from coal from the Albion mines analyzed as follows:

	Per cent.
Ash	18.38
Sulphur	0.87

This showing would undoubtedly condemn any property producing such coal and coke in any part of the United States.

Before returning to the States, I visited the output of the iron ore mines at Digby Bay, a deposit represented to be the largest and best in the province, and found it entirely unsatisfactory. I could see no indications of the existence of a large quantity of ore, and the specimen I brought away (a carefully selected sample) contained less than 40 per cent. of metallic iron, and was very high in silica, I think 21 per cent. It will be much cheaper for the New England furnace-men to use American iron ores, which are higher in metallic iron and lower in objectionable acids, or even to import Spanish, Cuban or Elban ores, paying the duty of 75 cents per ton, than to attempt to use any of the iron ores mined in the eastern Canadian provinces. And this applies to fuel also, for they will find that one ton of Pennsylvania coke, or 1¼ tons of anthracite coal, is worth two tons of any coke they can procure from the Canadian provinces.

We have chosen to give Mr. Evans letter in full, because it is the utterance of a thoroughly practical and keenly observing man who has been on the ground and knows what he is talking about. We commend his letter to the few misguided men who are leading off in a movement which, if it succeeds, can only result in disappointment and disaster to the industries which they blindly hope to build up, by tearing down others.

LAKE SUPERIOR ORE FOR EXPORT.

We have been shown the following letter from an Eastern financial house: "My firm has an inquiry regarding Duluth iron ore, from some friends in Europe. Can you put us in the way of getting some, at a moderate value, delivered in ports of Continental Europe? If so, please advise what it will cost, say c. i. f. or c. and f., to Rotterdam, Hamburg, or Havre, in large quantities." The firm in question has strong English connections, and the inquiry is legitimate and evidently "means business." Is this a prophecy of the coming exportation of Lake Superior Bessemer ore? If so, a great future seems to be opening up before American ore producers. The rapid exhaustion of European sources of supply has for some time attracted attention both here and abroad. Just what the present movement signifies does not appear on the surface, but the mere fact of such an inquiry will be read with great interest by iron men generally.

Pumping Engines.

A lecture on "Pumping Machinery, Ancient and Modern," delivered before the class of Mechanical Engineering of Sibley College, Cornell University, by Mr. J. F. Holloway, has recently been published in pamphlet form. Mr. Holloway, after speaking of the achievements of the first hydraulic engineer, passes to a brief consideration of the Cornish pumping engine, and then treats quite fully of the inventions of the Worthingtons, father and son, in direct-acting pumping machinery. He describes, in interesting language, the evolution of the modern pumping engine, beginning with the Worthington direct-acting steam pump, patented Sept. 7, 1841, followed by the direct-acting duplex steam-pump, which pump, in turn, was compounded for increased economy, and ending with a detailed description of the construction and operation of the Worthington high duty pumping engine, in which, by the use of compensating cylinders, any desired rate of expansion of steam is permissible.

THE Firth of Forth bridge in Scotland will use 50,000 tons of the finest steel, and one of its cantilevers, if placed on end, would be nearly as high as the Eiffel tower. The latter contains 7,500 tons of iron.

WE have more railroads than the rest of the world combined.

ON PUMPS FOR BOILER FEEDING.

Our illustrations, this month, show two arrangements of pumps that were designed for boiler feeding by this company, and have now been in successful operation for a considerable time by the Boston Duck Co., Bondsville, Mass., and the Otis Co., Ware, Mass., respectively. The particular difficulties that these systems were designed to overcome were as follows: In each case a large amount of water is used, and in order to run economically it was desired to return the drip from the various mills to the boiler room. This was attended with some difficulty, as the boilers are higher than the points where the traps must be placed. A survey of the yards showed that certain points could be selected, though at considerable distances from the boiler houses, to which the drips could easily be returned; and it was resolved to place the receiving tank at these points. In order that the pumps might be flooded, it was necessary to place them in the same pits with the tank, several hundred feet from the boilers; and after some consideration it was decided to do this, and to arrange the pumps so that they might govern themselves automatically, and not need the personal attention of the firemen.

Fig. 1 shows how this was accomplished at Bondsville. Into the tank, A, all the drips from the mills are discharged, by means of traps of our own design. The exhaust from the pump also discharges into the same tank. The water in tank A is maintained at a constant level, by means of a governor, J, which controls a valve, H, in the feed pipe, G, in the usual way. This governor communicates with the tank by means of the pipes shown, which are provided with cocks, L and K, so that the governor may be shut off from the tank when desired. Within the tank the feed pipe is perforated, as shown at V, so that the incoming water may condense any steam it may come in contact with, and be itself heated thereby. A blow-off is provided at N, and a three-inch overflow pipe at P, which discharges surplus water into the blow-off through R, and allows any uncondensed steam to escape through Q.

The pump, B, draws its supply from the tank through pipe D, and discharges through M, which passes to the boiler room. Steam to operate the pump enters through the pipe C, which is provided with a reducing valve, as shown, which serves to maintain the pressure on the steam end of the pump constantly at 35 pounds, which is indicated by the gauge E. The water pressure in pipe M is indicated at F.

The operation of this system is very simple. If the attendant in the boiler-room shuts off all his valves, the pressure in the water pipe, M, immediately runs up to from 100 to 105 lbs., the steam and water cylinders of the pump being so proportioned that when this pressure is attained, the water in M just balances the reduced steam pressure in C, and the pump can no longer run. It, therefore, remains motionless until a valve is opened somewhere on the pipe M. Then, the pressure in M being relieved, the pump is no longer balanced; the steam pressure preponderates and the pump starts. This adjustment is so fine that if the attendant opens his valve a single spoke the pump responds immediately, and moves so slowly that its motion can hardly be seen; while if he opens all his valves wide the pump instantly starts at full speed.

To prevent unpleasant rattling and pounding in the boiler room, a standpipe, S, is provided near the boilers, which acts as an air chamber and causes the whole to work smoothly and noiselessly. It happens occasionally, as for instance when the temperature of the boiler-feed is changed, that some of the air in S is absorbed or dissolved by the water, so that in time (say once in two or three months) pipe S becomes filled with water and ceases to act as an air chamber. In this case it is only necessary to stop the pump for a few moments and open the small cocks T and U. Water then runs out at U and air bubbles up through T into the chamber overhead. When sufficient air has entered, the small cocks are closed and the system is ready for operation once more.

The plant at the Otis Co.'s mills is similar in principle, but somewhat more complicated in its details, owing to the fact that a power pump is there used, in addition to a steam pump. The operation of this plant will be understood from Figs. 2 and 3, which are, respectively, an elevation and plan of the whole system. In these figures A is the tank for receiving the drips, X is the governor and U the valve that regulates the flow of water from the river into the tank, through the perforated pipe V. The power pump, B, has two fly-wheels, C and D, on one of which runs the driving belt. It draws water from the tank through pipe E, and delivers through G K L to the boilers. The steam pump, P, is provided with a reducing valve, Q, as in the plant previously described; it draws its water from the tank through M, and delivers it to the boilers through R R^1 L_1. At T a pipe is shown which runs through the mills and supplies water in case of fire or other emergencies. Valves are provided at S and N that allow the steam pump to be shut off entirely if desired, and similar valves, H and F, are provided for the power pump.

The action of these combined pumps is as follows; The power pump, B, runs continuously, while the machinery is in motion, and it is ample in size to supply all the wants of the boilers. In case the demand for water is less than the supply that this pump affords (which is frequently the case), the surplus passes back to the tank A through a relief valve, J, which is set to open at 115 pounds water pressure. Under these circumstances the steam pump, P, remains motionless; for the steam pressure in it is kept constantly at from twenty-four to twenty-five pounds by means of Q, which corresponds to a pressure in the water end of 105 pounds, so that it is impossible for this pump to start unless the pressure in K L falls to 105 pounds or less—that is, it is impossible for it to start while the demand for water does not exceed the capacity of the power pump.

To follow the action of the pumps, let us first suppose that all the valves in the boiler room are closed. Then the pressure in the main, K L, rises at once. As soon as it reaches 115 pounds the relief valve I, opens, and after that the entire delivery of the power pump passes through J and W and back into the tank A. Now let us suppose that the belt on the power pump breaks. Immediately the delivery of this pump ceases, and the valve J closes. The pressure in the main, K L, is now 115 lbs., and both pumps are motionless. Now

suppose an attendant in the boiler-room opens a feed valve there, the pressure in the boiler being only 80 lbs., water begins to flow from the main into the boiler; but this reduces the pressure in the main, K L, which pressure, at the time of opening the valve in the boiler-room, was 115 lbs. The moment that this pressure falls below 105 lbs., however, the steam pump, P, ceases to be balanced; the steam pressure preponderates over the water pressure, and the pump starts with a velocity proportional to the demand for water, the working of this pump from this moment on, being exactly the same as the working of the pump shown in Fig 1.

Now let us go back to the beginning once more, and suppose that the belt on the power pump does not break, but that the demand for water, owing to a fire breaking out or to any other cause, suddenly increases, so that pump B can no longer supply it. The pressure in K L then decreases as before, the relief valve, J, closes, the steam pump, P, starts up the moment the pressure in K L falls to 105 lbs., and both pumps run together, the power pump at a uniform speed and the steam pump at a variable speed, depending on the amount of water that is wanted.

When night comes on the power pump of course stops at six o'clock, and the steam pump at once starts automatically and takes its place; and at seven o'clock in the morning the power pump starts once more and the steam pump stops.

In both of these plants pressure gauges are attached to the steam and water pipes, so that an occasional visit to the pump-room shows at once whether everything is working properly or not. Both systems also have an air-chamber in the boiler-room, as shown at S in Fig. 1; and it seems proper to say that in each case the pumps have worked smoothly from the outset, and the entire satisfaction of every one.

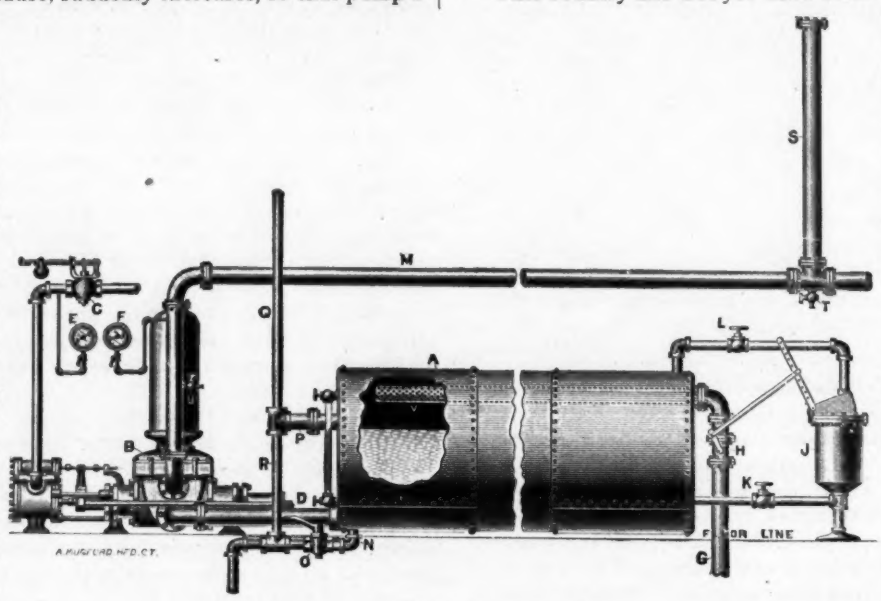


FIG. 1.

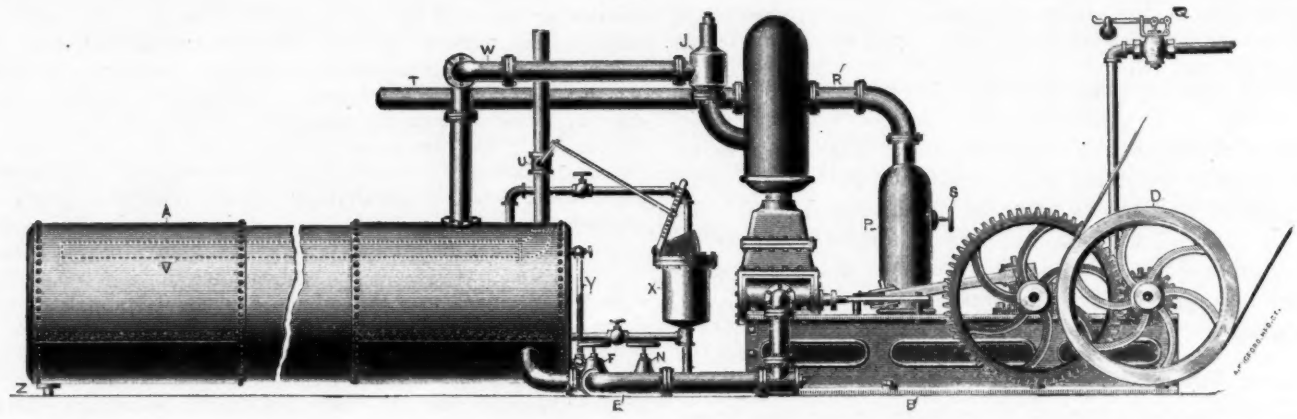
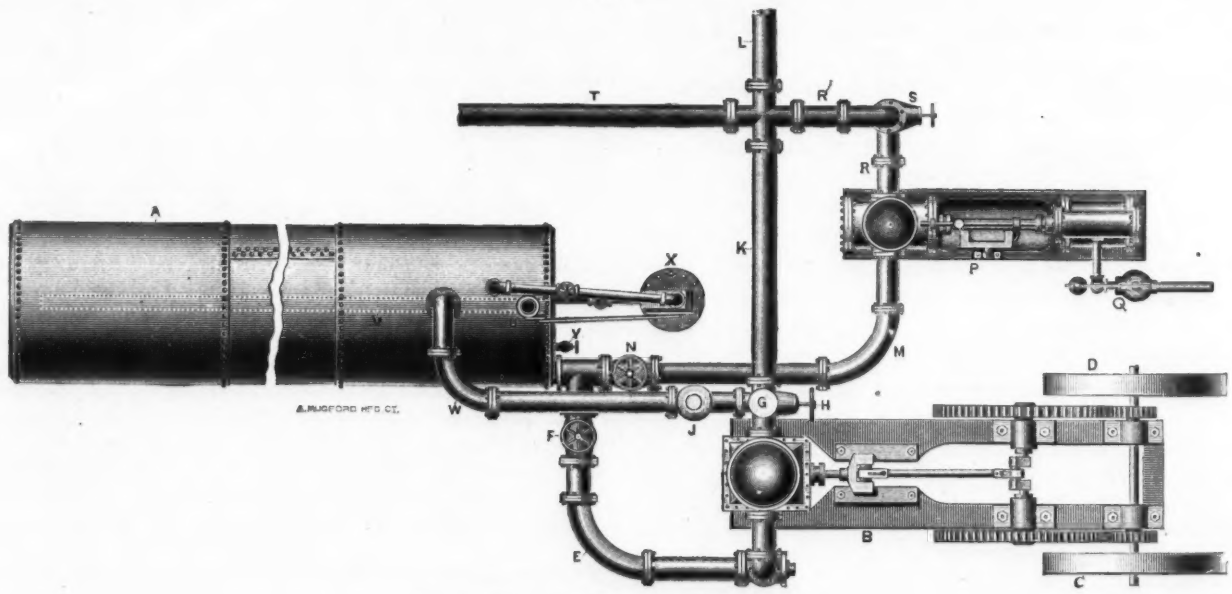


FIG. 2.



PUMPS FOR BOILER FEEDING.—FIG. 3.

In order that the advantage in economy that comes from returning the drips from the various pipes may be appreciated, we would call attention to the following figures: The water in the tanks of these systems has a temperature of between 160° and 290° Fah. Now, one of the companies referred to in the beginning of this article uses five boilers constantly, and for these boilers and the dye-houses between 15,000 and 20,000 pounds of water are required per hour. To raise this amount of water from say 70° to 170°, as many heat units must be expended as would evaporate say 2,000 pounds of water per hour; that is to say, it would be necessary for this company to run six boilers instead of five, if the drips were thrown away.—[The Locomotive.

THE FUTURE OF CHARCOAL IRON.

Discussing the above subject, the *American Manufacturer* says: The chief demand for charcoal iron at the present moment is for car wheels and malleable iron castings. Beyond any doubt this demand will continue a large one for some time to come, but there is no disguising the fact that steel made from irons other than charcoal is rapidly encroaching upon charcoal iron even for these purposes. We do not mean, of course, that steel will make malleable castings, but that steel castings are taking the place of malleables for many purposes, and that steel wheels are supplanting, and must still more rapidly supplant, chilled car wheels in the near future.

This country has not yet used steel castings to the extent that they are being used abroad. While some most excellent steel castings are made in this country, it is a fact which we must acknowledge that in the production of steel castings we are very far behind other countries—notably England. The production of steel castings in Great Britain is very large and increasing, and they are put to uses for which, in this country, we are using forgings at a very much greater cost.

The heavier loads that are being put upon our freight and other cars, are demanding a wheel of greater strength and longer life than the chilled cast iron wheel. These wheels did admirable service when the weight put on a freight car, for example, was but 10 tons, but when this weight is increased to 30 tons, a chilled wheel is not as well adapted to use as a steel wheel. Quite a number of our railroads are investigating the subject of steel wheels, and are experimenting with different makes. We have in our office records of cast steel wheels, unrolled and unhammered, that have already made over 250,000 miles on the front of an engine, and seem good for two or three times as much greater mileage.

It seems to us evident, therefore, that steel must take the place of charcoal iron for many of the uses noted above, for which charcoal iron is now used. Whether the growth of the demand for this product will be so great as still to create a demand for the charcoal iron that is made is a question that is well nigh impossible to answer. What we mean to indicate is that for the two purposes—fine castings and car wheels—charcoal iron will not hold in the future the undisputed place that it has in the past.

AMONG THE IRON MINES.

Lake Superior Mining Notes:—

GOGEBIC RANGE.

The Norrie, the leviathan of the Gogebic range, has turned the half million ton corner, and that it will send out over 600,000 tons is now very evident. The Norrie is operating about eleven shafts and is a busy property throughout.

Supt. Trazona pays very frequent visits to the Section 16 option which is looking very fine, indeed. Everybody expects that this property will be one of the shippers by another season. The mining options, without an exception, are looking very fine, and an assay of the ore shows a finer grade of iron than that produced by any mine or option west of the Father Hennepin.—[Iron Tribune.

The Wisconsin Supreme Court on Tuesday gave John E. Burton, the examining king, a big victory against the Central Trust Co., of New York. The company loaned Burton $33,000, and in the Walworth County Court recently tried to foreclose a trust deed for that amount. Burton pleaded usury on the part of the company and the latter demurred to the answer. The demurrer was overruled and the company appealed. The Supreme Court affirmed the decision of the lower court and declined to appoint a receiver for the property.

VERMILION RANGE.

A visit to the Minnesota mine, this week, revealed the fact that the new buildings which have been built this Summer, and the new and powerful machinery which is now being put in place is a matter of no small signification, as regards the developments of this, the largest hard ore mine in the world. Everything is teeming with life. Not only in way of buildings and new machinery is there activity, but in drilling, test-pitting, sinking new shafts and stripping there is a most industrious appearance.—[Iron Journal.

Mr. Jos. Sellwood was in the city a few days of last and this week, looking after his business in the iron metropolis. Replying to the question as to how the Minnesota field was looking, he said it gave every indication of being healthy. The Chandler, the mine he is giving particular attention to at present, had sent out 260,000 gross tons of ore up to, and including, Saturday night of last week. He said he noticed in the columns of our paper that the Lake Angeline had raised 20,000 tons last month. The Chandler had produced 40,000, twice the amount of our Ishpeming mine, and had raised it all from two shafts. The ore is a hard hematite, all blasting ground.—[Iron Ore, Ishpeming.

MARQUETTE RANGE.

We learn from *Iron Ore* that the old Saginaw mine is to be unwatered with a view to the resumption of mining work. The property has lain idle for about seven years. At one time it was looked upon as the leading mine of this section, it presenting a magnificent showing of ore. The fact that it sent out 447,104 gross tons of ore during the few years it was wrought, shows that it deserves the name of a big producer, and when the pinching out of its mineral treasure was announced, it was a surprise to the people in general. The mine gave employment to about three hundred men, the location was a thriving one, and its collapse was a thing to be regretted. Ishpeming parties secured a lease of the property three years ago and did some exploring, finding nothing but lean hematite. Afterward the lands were leased by Lower Michigan capitalists and an organization perfected under the title of the Saginaw Iron Co., and exploring work commenced under direction of Mr. Lee Peck. A diamond drill was employed and has been in operation for some months. It is this company that will unwater the old mine. The undertaking is one that will require some time, as the underground workings are quite extensive, No. 2 having a depth of nearly 600 feet, and the water from the New Burt mine, an abandoned property that adjoins the Saginaw on the East, will also have to be raised. During its time of activity, the Saginaw was considered a very wet mine, the water charges being heavy, but it is also well known that the pumping plant was inadequate, being too small and constantly in need of repairs. With the improved pumping facilities now to be secured, the question of keeping the mine free from water is not a perplexing one.

MENOMINEE RANGE.

Ore has been traced nearly one thousand feet on the Miller property just east of Iron River, but its extent will not be developed until a boiler and pump have been secured.—[Diamond Drill.

Work in the main shaft at the Caledonia has been discontinued. The pumps and pipe have been taken up and the shaft allowed to fill. The shaft is about 110 feet deep with drift and cross cuts aggregating 100 feet, and in six hours after the pumps were raised the hole was full of water. Considerable exploring will be done on the property the coming Winter. It is understood that Mr. Calhoun is trying to secure an option on an adjoining forty. The vein of ore seems to bear more to the north and west of the main shaft.—[Diamond Drill.

By another year the immediate surroundings of the great Dunn mine will be entirely changed. It has become necessary to place in use larger and more powerful machinery, and to do so it is also necessary to erect a larger engine house, and many other changes from the present condition of things. The work will be commenced at once—in fact, has been commenced—and carried on through the Winter, and be in readiness for use in the work of next season. The machinery to be added will consist of two large compressors and two eight-foot Lane drums, besides considerable machinery of lesser consequence. When this is completed the Dunn will have the finest and best equipped engine house on the range, barring none, except, possibly, the Chapin. The old engine house will be removed and the ground on that side—the east—of the mine will be stripped off to the ore, which will be worked out down in the open pit. The old dirt dump at the north end is being removed, and a large stock dock will be built there the coming Winter. The Dunn has shipped 103,899 tons so far this season, and will probably better that by 30,000 or 35,000 before navigation closes. When all of the contemplated improvements are made, the Dunn will be in shape to crowd the big shippers pretty close, if not go ahead of them.—[Diamond Drill.

Lake Superior Shipments of Iron Ore:—

Shipments of iron ore from the mines of Lake Superior, for the season of 1889, up to Wednesday, September 25th, are as shown by the appended statement, condensed from the Marquette *Mining Journal:*

MARQUETTE RANGE.

American	12,577	Grand Rapids	5,007	Prout	4,938
Barnum	3,891	Hartford	524	Queen	43,781
Braastad	78,683	Humboldt	12,553	Republic	233,607
Bristol	4,883	Jackson	45,315	Republic Reduction Co.	17,624
Buffalo	28,328	Jackson, pit 7	11,206	Riverside	3,004
Buffalo, South	2,774	Jackson, pit 8	2,672	Salisbury	16,976
Cambria	47,266	Jackson, South	13,790	Salisbury Bessemer	23,113
Champion	153,943	Lake Superior	43,965	Samson	449
Cleveland	175,241	Lillie	26,089	South Buffalo	46,816
Cleveland, Hematite	42,392	Lucy	15,529	Superior	105,882
Cliffs shaft	99,542	Marquette	55,977	Superior, Hematite	67,598
Curry	13,813	Marquette Ore Co.	2,721	Volunteer	32,279
Detroit	4,995	Michigamme	28,132	Webster	117
Dexter	3,895	Milwaukee	43,891	West Republic	1,062
East Champion	2,647	Negaunee	61,267	Wetmore	13,588
East New York	14,923	North Champion	7,109	Winthrop	17,780
Edison	893	Pitts. & L. Angeline	173,698	York	12,844

Total, Marquette Range 1,884,799

MENOMINEE RANGE.

Aragon	613	Half & Half	4,059	Norway	57,976
Armania	35,793	Hamilton	7,362	Paint River	18,989
Chapin	374,031	Iron River	126,221	Perkins	8,840
Commonwealth	73,470	Ludington	81,718	Shafer	4,931
Cyclops	27,295	Mastodon	46,225	Sheridan	504
Dunn	103,899	Mastodon, South	2,094	Sturgeon River	4,754
Florence	121,406	Millie	9,502	Vulcan	120,752
Great Western	29,679	Monitor	7,403	Walpole	9,616

Total, Menominee Range 1,277,403

GOGEBIC RANGE.

Anvil	28,861	Iron King	31,750	Pence	62,875
Ashland	183,488	Ironton	5,776	Ruby	7,373
Aurora	146,001	Montreal	5,233	Section 33 south	30,678
Brotherton	50,390	Norrie	453,841	Sellwood Colby	21,111
Carv	35,474	North Montreal	24,610	South Colby	42,903
Colby, Beaver	33,677	North Section 33	13,097	South 15 Colby	10,221
Germania	78,923	Odanah	4,334	Windsor	13,412
Globe	8,379	Pabst	73,334		
Iron Belt	39,883	Palms	9,960		

Total, Gogebic Range 1,413,649

VERMILION RANGE.*

Chandler Mine	246,237	Minnesota Iron Co.	410,018	Pioneer	2,168

Total, Vermilion Range 658,453
Grand Total 5,248,254

Bad weather interfered greatly with lake shipments of ore during the past week, and the total for the week shows a marked falling off in consequence.

Exposition Statistics,

The London exhibition of 1851 covered 21 acres, attracted 17,000 exhibitors, cost $1,463,970, was open for 144 days, received $2,530,500, and admitted 6,039,195 visitors.

The Paris exposition of 1855 covered 24½ acres, attracted 21,779 exhibitors, cost $5,000,000, was open for 200 days, received $640,495, and admitted 5,162,330 visitors.

The London exposition of 1862 covered 23⅓ acres, attracted 28,653 exhibitors, cost $2,300,000, was opened for 171 days, received $2,042,650, and admitted 6,211,103 visitors.

The Paris exposition of 1867 covered 37 acres, attracted 50,226 exhibitors, cost $4,000,000, was open for 217 days, received $2,103,675, and admitted 10,000,200 visitors.

The Vienna exposition of 1873 covered 40 acres, attracted 42,584 exhibitors, cost $11,000,000, was open for 186 days, received $1,032,350, and attracted 7,254,687 visitors.

The Centennial at Philadelphia covered 60 acres, attracted 60,000 exhibitors, cost $8,000,000, was open for 159 days, received $3,813,720, and admitted 9,910,966 visitors.

THE *Century Magazine* closes its nineteenth year with a number for October which, besides its leading serials on Lincoln and Siberia and the Old Masters, contains several papers of peculiar importance. One of these is a study of "Moliere and Shakspere," by the eminent French comedian, M. Coquelin. A group of brief illustrated articles, of especial interest to readers of this journal, on manual training, presents this subject from three different points of view—the articles being by Professor Butler, of the New York College for the Training of Teachers; Professor Thorpe, of the Philadelphia Manual-Training School, and Dr. Felix Adler, founder of the Workingman's School and Free Kindergarten, of New York. An extremely timely illustrated paper is that from the expert hand of Mr. Walter Camp, and entitled "Base-ball—for the Spectator."

GENERAL O. O. HOWARD has written an article for the young folks who read *Wide Awake* which will also interest and enlighten their elders; we refer to the little paper in the October number entitled "How many Indians in the United States?" In the same number Miss Rose Kingsley, Charles Kingsley's daughter, has a valuable contribution about "The Boy who Invented the Telegraph"—Claude Chappe, a little French lad. The stories, as usual, are excellent. *Wide Awake* is $2.40 a year. D. Lothrop Co., publishers, Boston.

THE Philadelphia electricity exhibit at the Centennial Exposition in 1876 was very small. To-day $300,000 is invested in 3,000,000 lamps and 109 railways.

GERMANY is making steel fly-wheels. They do double the speed of cast iron.

* Shipments for week ending the 25th not included.

THE HARRIS COMPOUND ENGINE.

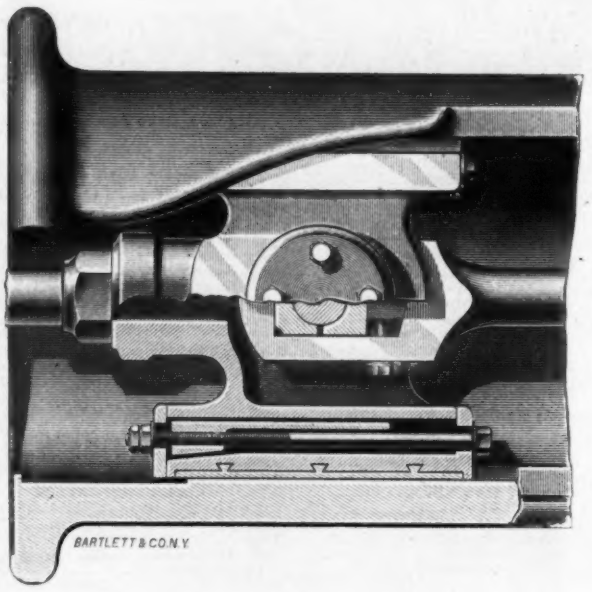


FIG. 5.

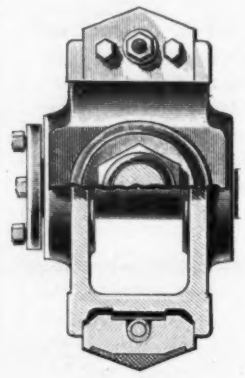


FIG. 4.

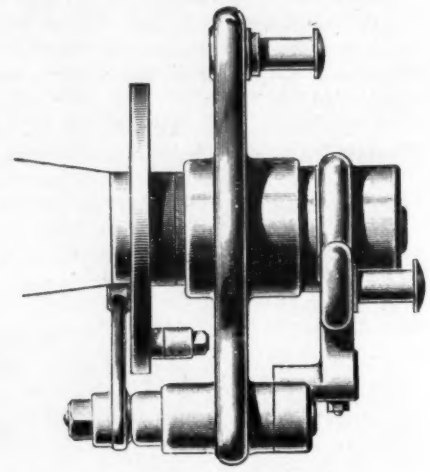


FIG. 1.

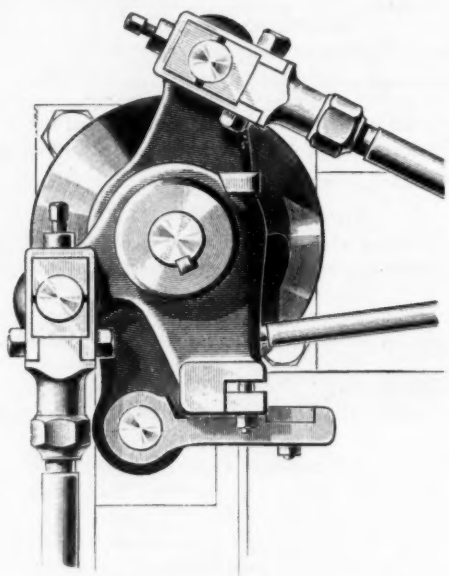


FIG. 2.

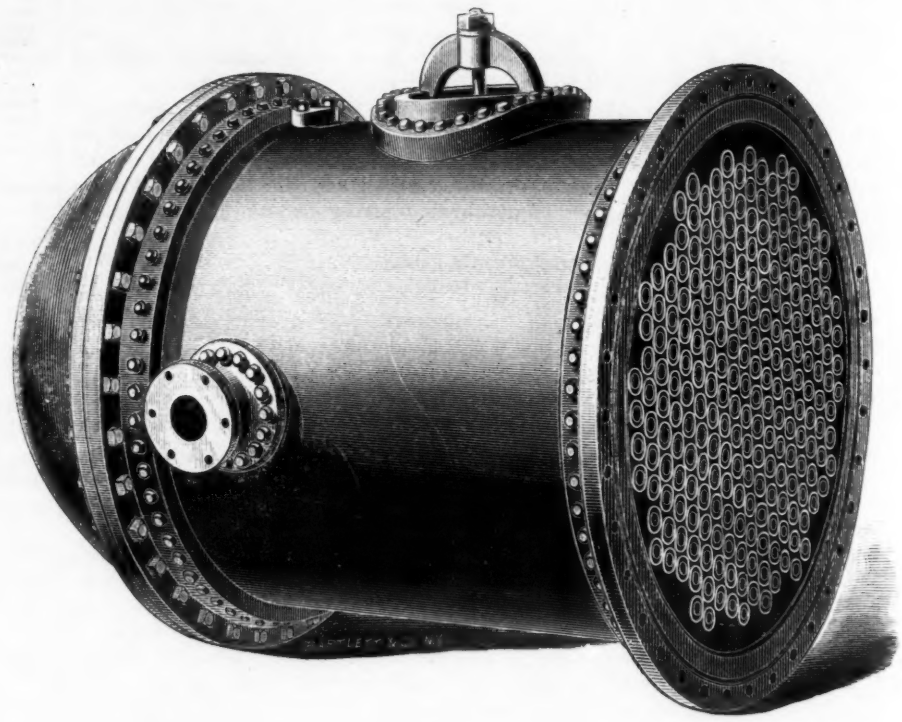
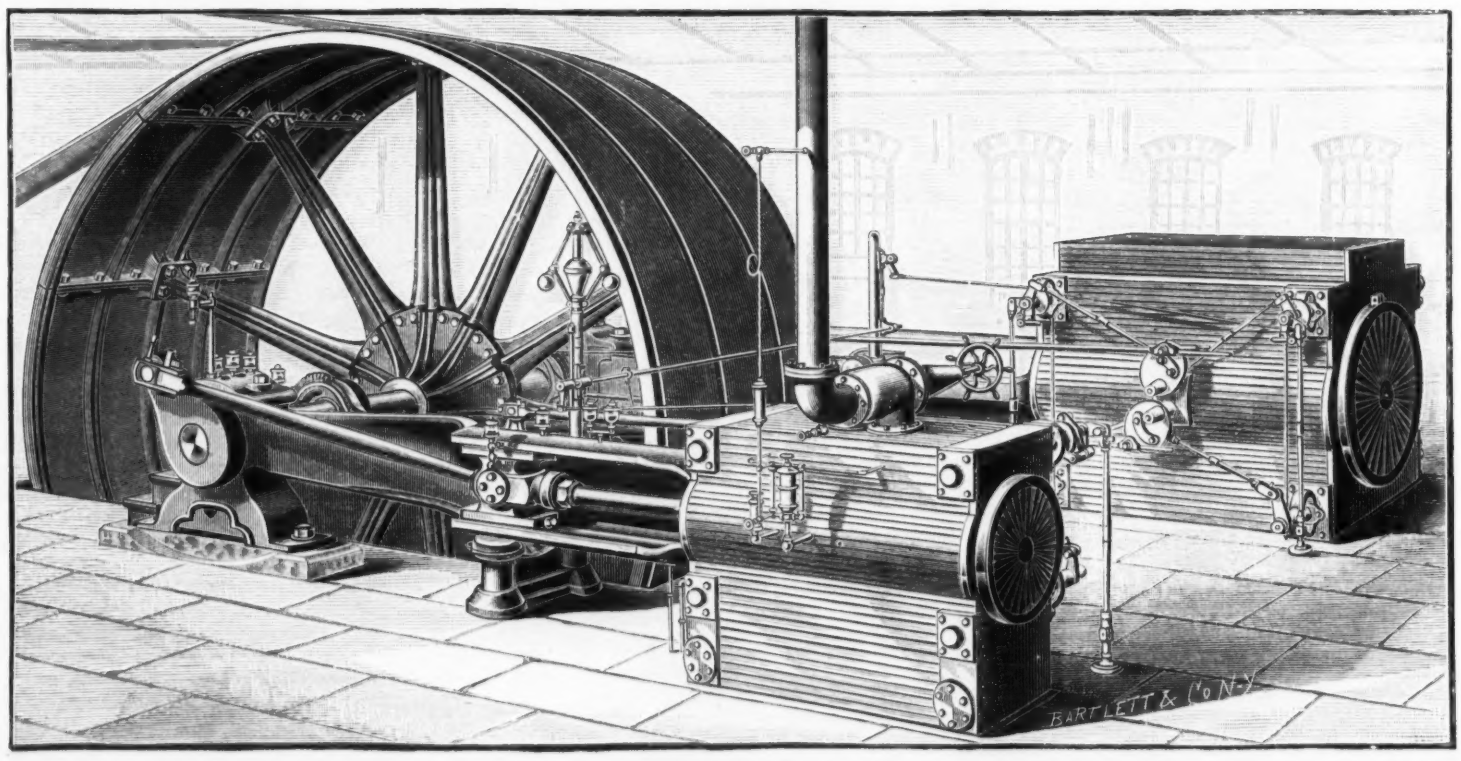


FIG. 6.



THE HARRIS COMPOUND ENGINE.

As a notable instance of the continued adoption of the compound principle in modern mill plants, we may instance the engine represented in the accompanying engravings, built by the Wm. A. Harris Steam Engine Co., for the new Sagamore Mill, at Fall River, Mass. The engine is almost severe in its simplicity, and notwithstanding its large proportions, the 52-inch low-pressure cylinder with its jacket and chest extending far above the head of the observer, the impression conveyed is one of graceful strength without hugeness or bulkiness.

The high-pressure cylinder is 28 inches in diameter and the stroke 72 inches. The fly-wheel has a diameter of 30 feet, a face of 96 inches, and revolves at the rate of 56 turns per minute, giving to the belts which it carries a linear velocity of 5,281 feet per minute. The engine runs with an initial pressure of 125 pounds, and is rated at 1,100 horse-power.

This engine embodies several features of particular interest, prominent among them being the new releasing gear, used for the first time on the steam valves of this engine, and shown in detail in Figs. 1 and 2.

A little study of these figures in connection will result in a perfect understanding of the mechanism employed and its method of operation. The connection from the wrist-plate is shown at the top of Fig. 2, the corresponding pin being shown in a side view at the highest point in Fig. 1. The lever, which is reciprocated by the wrist-plate through this connection, carries at its lower end a hook or bar, upon which is a steel block which engages a similar block upon the arm which is keyed to the valve stem. The hook or bar first mentioned is not attached rigidly to the lever, but journaled in its end, as shown most plainly in Fig. 1, so that it would be free to hang straight downward were it not supported by a rod attached to its inner end at the left, in Fig. 1, the other end of which rod is supported in a cam groove in a circular plate mounted upon the valve-stem bearing.

Now, it will be seen that with the parts in the position shown in Fig. 2, movement would be communicated from the wrist-plate through the hooks to the steam valve, and that if the cam path in the plate alluded to were a smooth curve which would always keep the hook up to the block on the steam valve, no cut-off would take place, but in this path is a sudden deviation from a concentric line which, when the pin or roller strikes into it, forces the hook or bar downward, and out of engagement with that upon the valve-stem and the cut-off occurs. The cam plate being rotated about its centre by its connection with the governor rod, brings this point of change in the direction of the cam at the point necessary to effect the cut-off at the required time.

The block upon the valve-arm is suspended upon a bolt, as shown, and is free to move upward as the other block passes backward under it, falling by its own gravity into engagement. A recurve in the further end of the cam prevents an engagement in case of an accident to the governor, and obviates any possibility of the engine's racing.

The action of this arrangement is extremely satisfactory. The movement of the hook being controlled by a pin in a path-cam is positive, and the centre upon which the releasing bar turns being below the plane of contact of the blocks, the disengagement when allowed of by the path-cam, is so easy as to cause no perceptible jar upon the lever in direct contact. The blocks are so offset, as will be seen in Fig. 1, as to be in contact but half their length, and each block may be changed in position to present eight different edges to wear. Should the dash-pot fail to work, or for any reason the valve remain open, it will be forced to close as the wrist-plate returns to its central position by the contact of the flatted place upon the hub of the bar with a projection upon the valve-arm.

Another feature, and one which will attract immediate attention, is the use of separate eccentrics for the steam and exhaust valves upon the low-pressure side. The value of this method of connection has often been commented on, and will be appreciated by any engineer who has attempted to compromise between the steam and exhaust valves in adjusting a Corliss engine.

The conventional form of condenser and air-pump, operated from the crank-pin of the low-pressure side, are used, but between the low-pressure cylinder and the condenser is attached a feed-water heater, shown in Fig. 6, designed especially for use in this connection by the Wainwright Manufacturing Co., of Massachusetts. This heater contains 1,059 feet of corrugated copper tubing, two inches in diameter, through which the steam exhausted from the low-pressure cylinder is passed on its way to the condenser. The feed-water flowing about the outside of these tubes is raised from a temperature of about 60 degrees to 135 degrees, with a vacuum in the condenser of 25 inches. The heat thus imparted to the feed-water is rescued from the hot well, being clear gain, and the condenser has just so much less heat to abstract from the steam by means of the injection water.

The heater thus not only economizes in the direction of heating the feed-water, but acts as an auxiliary to the condenser as well.

The difficulty of casting large jacketed cylinders as well as the liability to fracture when the jacket and cylinder are cast in one piece, through unequal expansion or the accidental letting of steam into the cylinder without warming up the jacket, has been well surmounted by the builders of the Harris engine by casting the cylinder in several parts and assembling it as shown in Fig. 7. The bore is in one piece, secured at the stuffing-box end of the cylinder, and free to slip at the other end as changes of temperature alter its length with respect to the contiguous parts This design offers numerous advantages in construction, precludes liability to accident from unequal expansions, and reduces the item of repairs in many instances, from the throwing out of an expensive jacketed cylinder to a simple renewal of the casting containing the bore.

The improved Harris cross-head, shown in Figs. 4 and 5, has won the unqualified approval of engineers. The piston rod is attached by screw and lock nut, and the wrist-pin located at the centre so as to bring the thrust directly upon the guide, without the tendency to tip manifested in that form in which the connecting rod is attached to a projection in front of the centre, the adjustment is easily made in an obvious manner, by means of the wedge and screw shown.

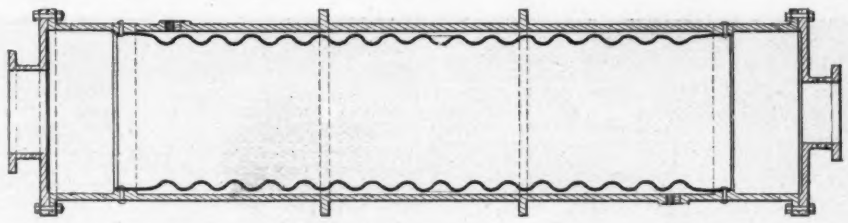


FIG. 3.

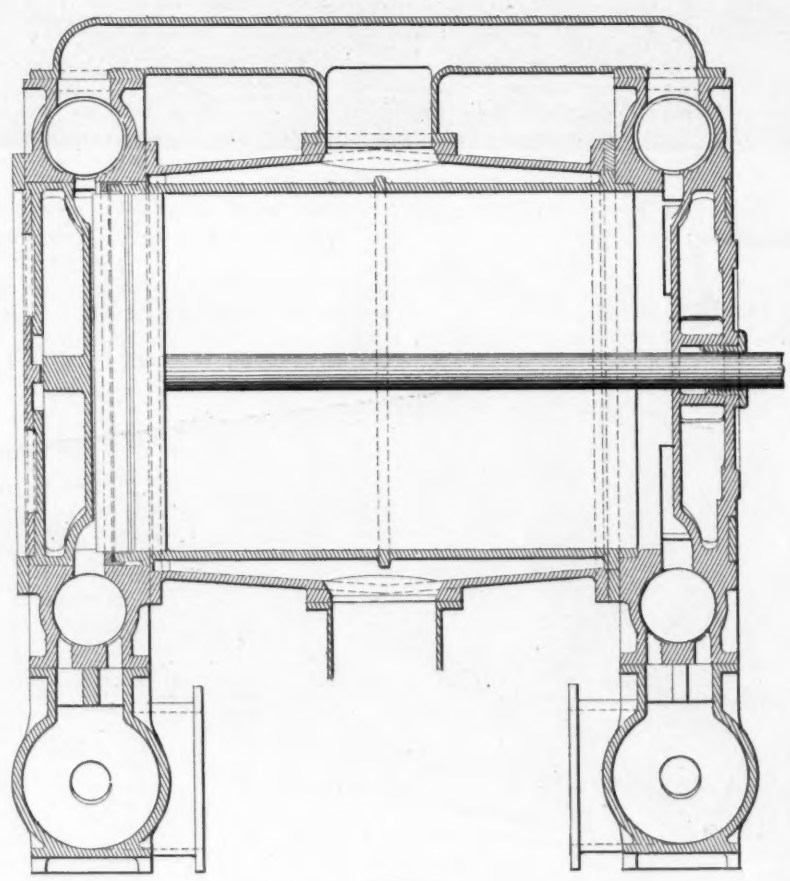


FIG. 7.

For their receivers the Harris Co. have hit upon a happy idea, at once simple, effective and economical. They are made from corrugated tubes of about five-sixteenth iron, enclosed in a cast iron jacket, as shown in Fig. 3, the steam passing through the inside of the tube, while the space between the tube and the cast iron jacket is filled with live steam for drying and regenerating the steam as it passes between the cylinders. The corrugated tube allows of expansion and contraction, with rigid connections at the ends, affords a larger amount of heating surface than plain tube, and by breaking up the current of steam, and bringing more of it in contact with the iron renders the surface more effective.—Power-Steam.

American Pumps at the Exposition.

Considerable comment has been made upon the paucity of the American machinery exhibit at the World's Exposition at Paris, and the meagreness of the pump display has been alluded to in view of the fact that the United States undoubtedly leads the world in this particular line. The disappointed observer who missed the conventional array of graduated sizes ranged on a platform, or nickel plated specimens pumping water out of and into a tank, might have found some consolation in the fact, that for the actual maintenance and operation of the water supply and hydraulic machinery, the exhibition is dependent upon American pumping machinery. Should the visitor go to the pumping station, located upon the banks of the Seine, he would find a Worthington high duty pumping engine at work supplying the Exposition with water; the elevators in the famous Eiffel tower are operated by pressure pumps of the same make, and numerous other American pumps are engaged in serviceable capacities all about the exposition. To one who sees behind the scenes there are many things more conspicuous by their absence from the Paris Exposition than American pumps.—[Power-Steam.

THE total coal consumption of the world is said to amount to more than 1,000,000 cwt. per hour. Of this quantity about 240,000 cwt. are required per hour in order to heat the boilers for stationary and marine engines, locomotives, etc. The production of pig iron requires 100,000 cwt. and that of other metals 80,000 cwt. per hour. The average hourly consumption of household coal is reconed at 200,000 cwt.

A MOSCOW foundry fuses metals by electricity. The glare is greater than the sun, and employes work two hours per day.

SWITZERLAND has an electric railway up a 1330-foot mountain.

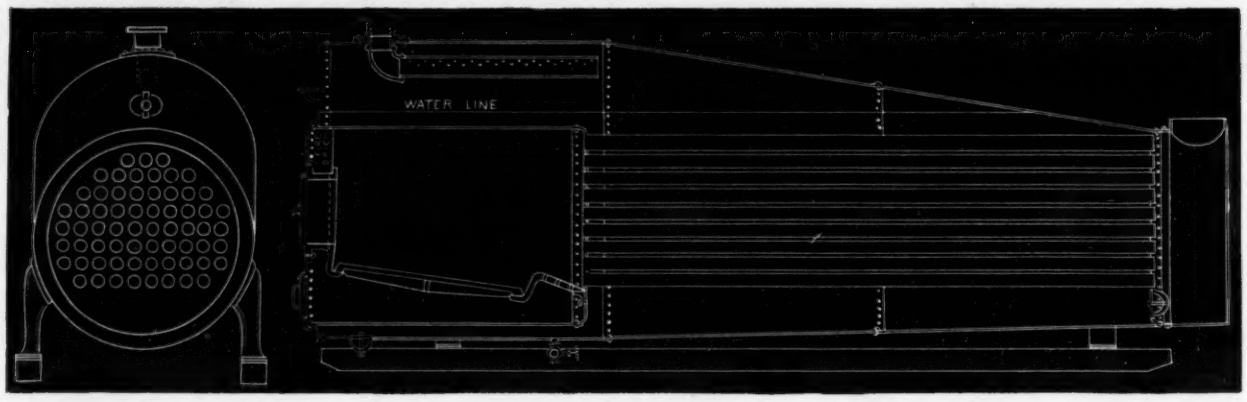
HALL'S PATENT SCOTCH FLUE BOILER.

The boiler herewith shown is claimed to be the most economical type of portable boiler in use, because of its Scotch flue fire-box, which necessarily reduces the grate surface. The manufacturers make the grate surface the most economical sizes for burning soft coal slack or other cheap fuel. They then put in a combustion plate one foot wide, with air holes, in order to set the gases on fire before entering tubes. This combustion plate makes the fire-box one foot longer, so that wood can be used without any change of grates. These boilers are full capacity. A 25 horse-power will do 25 horse-power work, while ordinary portables it is claimed, are reduced from 10 to 20 per cent. In reduced grate surface and full capacity the manufacturers have followed the celebrated Tifft boiler that has been used in the oil business for the past thirty years, and of which at least 100,000 are in use to day.

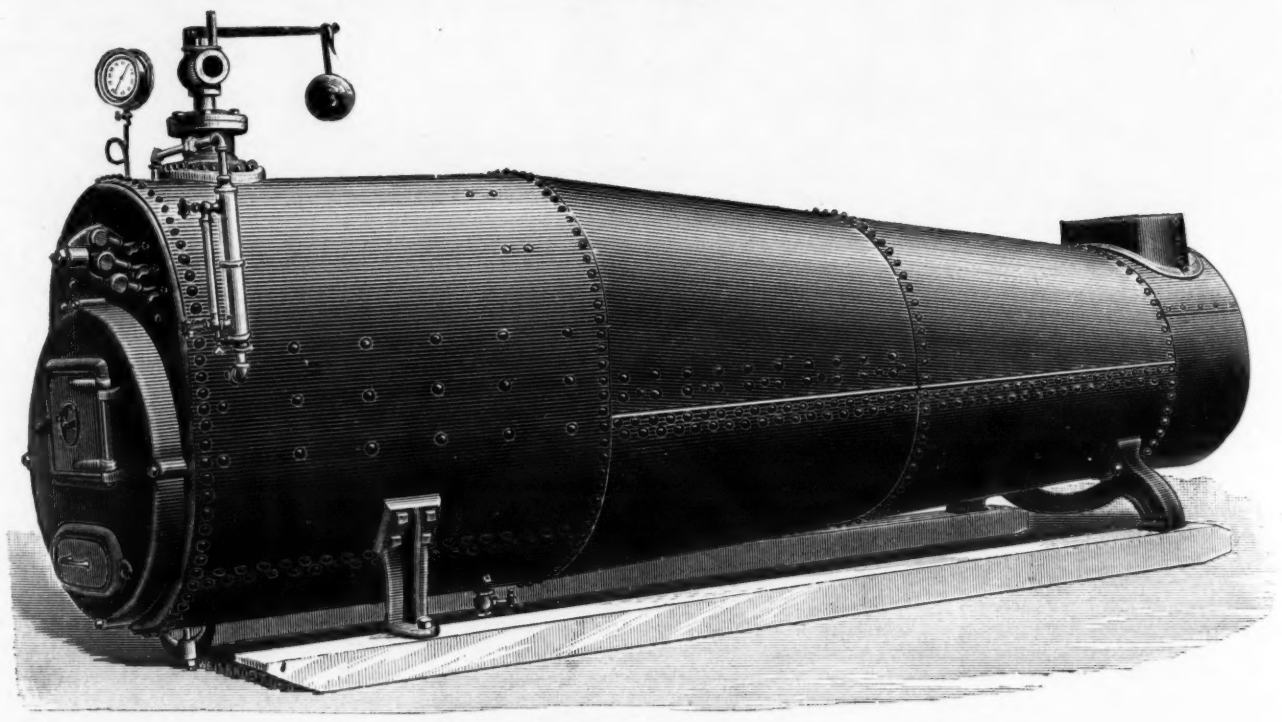
The Scotch flue fire-box is simple in its construction, strong and durable The fire-box head is a plain, round head, and the back head the same, and both full of tubes, not one brace, with just room below the hand-hole plates to clean out, hence its cheapness. It is a well known fact that a Scotch flue marine boiler will save 25 per cent. of fuel over the old style of marine boiler. The chief engineer of the Anchor Line says the saving is wonderful; that he cannot account for the large saving, while the simple fact is that the Scotch flue necessarily reduces the grate surface one-half or more, just the same as the Tifft is reduced over one-half.

The fire front is the size of the fire-box, and is lined with fire brick to prevent radiation and cracking in front. The large hand-hole plates above the fire-box and below tubes for cleaning, will be noticeable. The dry pipe is three to five feet long, owing to size of boiler, thus saving the possibility of priming or drawing water with steam. The holes are in the top, so that if there should be any priming the water would drop back into the boiler and dry steam would come in at the top, hence its name dry pipe. The dome makes a large exposure and every particle of heat that radiates from it knocks just that amount of steam back into water, and you have wet steam.

This boiler has a taper shell which gives the steam a free passage to the dry pipe. The same taper gives the boiler a free circulation. As the water is first heated by the fire-box, the tendency is to make a current towards the back end, and then the taper on the bottom carries the sediment forward to the blow-off cock under the back end of the fire-box, it being the lowest point. There is not any place for braces and very few stay bolts, and it is lighter on account of its shape. Besides, it is low and more suitable for mounting, and especially on wheels. These boilers are all made of the best 60,000 pound tensile strength steel, side seams, doubled riveted, well stayed and braced, all hand riveted tube holes cut out instead of being punched, and tested as per Government laws up to 150 pounds water pressure, and then with steam to 100 pounds, and made perfectly tight. Messrs. D. K. Norton & Son, Cincinnati, O., will give all additional information.



SECTIONAL VIEW.



HALL'S PATENT SCOTCH FLUE BOILER.

Gas at Five Cents Per Thousand.

It is announced that a company already in operation at Litchfield, Ill., will pipe fuel and illuminating gas into East St. Louis. Mr. Henry O'Hara, a capitalist of St. Louis, who is prominent in the enterprise, says they have a process for manufacturing gas from Lima (O.) oil, which costs 1¼ cents a gallon. This amount of oil renders over 1,000 feet of gas. They have eight miles of pipe down, and are furnishing families at a rate which for lighting a large house and supplying three stoves with fuel takes but $54 per annum from the proprietor's pocket. The plant they are putting into Litchfield will cost some $60,000. From this they propose to lay an 8-inch gas main to East St. Louis, 37 miles, and deliver their product there at a price far below that which the company now in power there can do. They claim that they can give light and heat to the city at five cents per 1,000 feet of gas, or give it away for a long time and scarcely feel it, the production costs so little. In explaining the process Mr. O'Hara said: "A bench, that is, a plant with twelve retorts, will cost about about $5,000, and will supply a town of 6,000 inhabitants; it would produce 60,000 feet of illuminating gas daily and 13 times as much fuel gas; here are the figures—120 gallons of crude petroleum, $1.50; gas for operatives, 30c.; one workman, one day, $2; total, $3.80—product 200,000 feet. The crude oil is introduced to the furnace direct from the tanks. Steam forces it into spray, and, mingling, both absorb the elements from the air and a chemical degeneration commences that winds up in non-condensable, non-explosive gas. For intensity of heat the fuel gas excels. I have seen Swedish iron, which requires 4,500° made with it; and also crucible steel, not only made, but melted and burned up in a few minutes."—[American Manufacturer.

THE TRIENNIAL CONCLAVE.

Low Rate Excursions to Washington, D. C., via the Pennsylvania Lines.

Tickets to Washington, D. C., for the Triennial Conclave of the Knights Templar, will be sold to all applicants from the principal stations on the Pennsylvania Lines West of Pittsburgh, at the rate of one lowest limited first-class fare for the round trip on October 4th, 5th and 6th, 1889, and tickets may be obtained at any station if timely notice is given the agent. They will be good returning until October 31st, and special arrangements have been made to accommodate passengers desiring to visit New York. For complete information call upon or address the nearest passenger or ticket agent of the Pennsylvania Lines. This Triennial Conclave will be a memorable sight, and there is no better time to visit the East than in the Autumn.

INDUSTRIAL SUMMARY.

New Enterprises :—

The Ohio & Michigan Anglo-American Storage Battery Co., East Saginaw, Mich., has been incorporated, with $1,500,000 capital.

Saginaw (Mich.) capitalists have organized an iron mining company to operate a mine they own at Ishpeming. Capital stock $400 000.

A movement is said to be on foot to form a stock company to build a new rolling mill at Dunbar, in Fayette county, Pa., on the Baltimore & Ohio railroad. It is proposed to erect 30 puddling furnaces, and manufacture skelp iron exclusively.

The Lancaster Iron Co., of Pittsburgh, has been granted a charter, with a capital stock of $1.000. The directors are Edwin H Smith, Charles S Crawford, Charles C. Morrow, W. A. Schmidt ,William Beal, L H. Matthews and Frank W. Smith.

A charter was granted last week to the Midgley Wire Belt Co., of Beaver Falls, Pa., capital, $350,000. The directors are James E Emerson, Thomas Midgeley and E. L. Hutchinson, of Beaver Falls; James W. Rabe, of Philadelphia, and C. M. Russell, of Massillon, O.

The firm of Chamberlain, Wheeler & Co. have become incorporated under the name of the Virginia Iron Co.; capital, $100,000 They have changed the name of the Victoria Furnace to that of Rockbridge Furnace, and will sell their iron under the brand of Rockbridge. Mr. Ed Orton has resigned his position as founder, and Mr. Beck of Lynchburgh, Ky., has taken charge.

The contract for the large buildings of the Hotchins Nut & Bolt Works, to be erected one mile south of Greensburg, Pa., have been let to the firm of Zahniser & Co. There will be six buildings. The work will begin at once and the works are expected to be in active operation by January 1. The capacity of the works will be over 125,000 nuts and bolts a day, and will employ about 250 men.

Recent Illinois incorporations: Minerva Furnace Co., Chicago; to operate a pig-iron blast-furnace; capital, $25,000; incorporators, John C Bryan, Jesse Holdon, Joseph H. Nott.—Stearnes Manufacturing Co., Chicago; to manufacture heating and cooking stoves; capital, $50,000; incorporators. Alfred T. Stearnes, Samuel W. Joy. Francis W. Walker.—Kenwood Manufacturing Co., Chicago; to manufacture machinery and hardware; capital, $25,000; incorporators, Frank Douglass, Frank I. Douglas and William C. Niblack.

Application for incorporation has been made by the Canada Iron Furnace Co., of which P. H. Griffen, car wheel manufacturer, of Buffalo, N. Y., Robert Schott, Sheffield, England, and several Canadian capitalists are the directors. The chief place of business is to be at Montreal. The capital stock is $200,000. The company is to manufacture iron and steel, to operate in coal and iron mines, foundries, rolling mills and steel converters.

Papers were signed last week by which 111 acres of land at East Chicago were transferred to a Cleveland (O) land firm, on behalf of an iron company of that city, for a consideration of $400 per acre. The purchasers, it is given out, propose to erect an iron rolling mill plant, which is to be in working order by the opening of Spring. Six hundred hands will be employed, and the estimated cost of the improvement is $250,000.—[Industrial World.

A dispatch from Chattanooga, Tenn., September 29, says: A number of owners of charcoal iron furnaces in middle Tennessee with a syndicate of New York capitalists, to day organized under a charter in the state of Alabama, at Huntsville, the Southern Iron Co., and closed the purchase of three charcoal furnaces in middle Tennessee, one charcoal furnace at Attalla, Ala., and the Roane Iron Co's steel rail mill in this city. The company organized with a capital stock of $2-0,000 paid up. The purpose of the company is the immediate remodeling of the mill here to make steel by the basic process, using Siemens-Martin furnaces. The product of all the furnaces will be brought to this city to be manufactured into steel rails, nail plate, steel wire and plates of all kinds.

Enlargements, Additions, Removals, etc.—

The Knowles Steam Pump Co. will at once enlarge its shops at Warren, Mass., by building an addition.

It is reported that Cooper, Hewitt & Co. contemplate the erection, at Trenton, N. J., of three large, open-hearth furnaces. They will use the basic process.

The Etowah Iron Co., who are to develop iron and manganese mines on the Etowah property, near Cartersville, Ga., will erect improved ore washers at once. Their capital stock will be $1,000,000.

P. H. Corr, of Boston, has bought the entire plant of the Old Colony Iron Works, at East Taunton, Mass. He is negotiating with out-of-town parties for the establishment of a special class of work in the rolling mill.

The machine shops of the Louisville, St. Louis & Texas Railroad, which were recently burned, at Henderson, will be rebuilt at Cloverport, Ky., the citizens having raised a bonus of $20,000 to secure their erection at that place.

A dispatch from Wheeling, W. Va., says that the old Waldorf Furnace, situated at Ironton, Taylor county, has been sold at auction for $3,000, and will be torn down and the material removed to Ohio. When this furnace was built in 1873 it cost the owners $100,000.

The Chicago Bridge & Iron Co., which was recently organized with a capital of $100,000, is building an extensive plant at Washington Heights, near the crossing of the Rock Island and Panhandle railways. The work of putting up the plant, which was moved from Kansas City, will be completed in a few weeks.

The two anthracite blast furnaces of the Keystone Furnace Co., which failed recently, were sold at Reading on the 19th ult. to the Reading Iron Co. for $100, subject to a mortgage of $175,000, this gives the new Reading Iron Co. control of four furnaces, besides its numerous mills. It is stated that all four furnaces will be in blast in about ten days

The growth of the Westinghouse Machine Co.'s business, at Pittsburgh, still continues. During the past five years its buildings have been extended from the square in Pittsburgh originally occupied by the Westinghouse Air Brake Co. until they now cover two and one-half blocks of contiguous property. Machinery has been added (much of it quite recently) until now the limit has been reached and there is no space for more. No aditional property is available in the vicinity, and to keep pace with the constant growth of the business the company is engaged in erecting a three-story warehouse for finished engines, repairs, etc., which will be provided with steam hoists, overhead cranes and all known appliances for the quick and economical handling of heavy weights. In addition to this, the company is now taking on a complete new force of workmen, so that the establishment will henceforth be operated continuously day and night.

Fires and Accidents :—

The machine shops of the Cincinnati Southern Railroad Co., at Chattanooga, Tenn., were recently destroyed by fire with a loss of $25,000. They will be rebuilt.

The works of the Enterprise Hardware Co., Limited, on Washington avenue, Allegheny, Pa, owned by W. H. Burt and O. K. Gardner, were almost totally destroyed by fire early Sunday. The loss is in the neighborhood of $10,000, fully insured. The company does a large business in the manufacture of novelties, such as door locks and keys, sash weights and light castings, and was rushed to its full capacity. The works will be rebuilt at once.

Noteworthy Contracts, Remarkable Records, Etc:—

The Carbon Iron Co., of Pittsburgh, recently turned out, in their works, a steel plate 16 inches wide, 135 feet long and ⅞ inch thick.

The National Lock Washer Co., of Newark, N. J., are in receipt of an order from London, Eng., for 1,250,000 of the National Lock Washer for export.

The Laidlaw & Dunn Co., of Cincinnati, O., have sold another 300 horse-power Galloway boiler to the Geo. H. Friend Paper Co., West Carrollton, O. This makes three of this size they have sold to this concern within a year.

The National Pipe Bending Co., New Haven, Conn., recently shipped two 400 horse-power feed water heaters to Osaka, Japan, for the electric light station there. This company sold 45 heater during the month of August, ranging from 150 to 800 horse-power. Their heaters go to all parts of the country, from Maine to California.

The Pratt & Whitney Co., Hartford, Conn., are manufacturing gun machinery for Belgium and Germany. The works will be run to the full capacity every hour in the day. The company are just finishing rifling machinery for the Lee gun, the arm adopted for the English army. The orders obtained there will reach about $600.000.

Furnace No. 3 of the Glendon Iron Co., at Easton, Pa., recently turned out 808 tons of pig iron in one week, with a fuel consumption of 1.09 tons for each ton of pig iron produced. This is the largest output for a single week obtained since the furnace was remodeled some time ago by Mr. M. P. Janney, the superintendent. Previous to that event the largest output of the furnace for a week but once exceeded 500 tons. This is certainly good work, and reflects credit upon the management of Mr. Janney.

The Braddock (Pa.) *News* states that an unprecedented feat in the steel industry was accomplished on Saturday, Sept. 14th, at the Homestead mill of Carnegie, Phipps & Co. "David Kennedy, a roller, has the honor of turning out the largest armor plate ever made in this country. It weighs 15,200 pounds, and its dimensions are 80x150 inches and three inches thick. The plate is without flaw or blemish. The firm has a large order for these plates from the United States Government. The rolling of slabs weighing 10,000 pounds and over is unusual, but it scarcely jarred the mill."

General Industrial Notes:

Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until 2 o'clock P. M., on the 16th day of October, 1889, for an iron stair for the U. S. Postoffice, Court House, etc., building at Auburn, N. Y.

The Ætna Machine Co., Warren, O., recently received an order from the Terre Haute (Ind.) Iron & Steel Co. for a 300 H. P. engine to drive a train of rolls in their rolling mill.

The N. Haughton Foundry & Machine Co., Toledo, O., inform us that they have received orders for elevators within the last few weeks, as follows: Buckeye Novelty Glass Co., Bowling Green, O.; Cleveland Target Co., Findlay, O.; Huber Manufacturing Co., Marion, O.; Brewer Pottery Co., Tiffin, O. (four elevators); Milburn Wagon Co., Toledo, O.

The Standard Manufacturing Co., Edinburg, Ind., inform us that they are having quite a run on their specialty of wood cutting machines. Their output is six machines daily, and they say this is not sufficient to meet the demand for their high grade of tools. They have recently introduced a new 7-foot band log mill, which they say is going to take the lead.

Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until 2 o'clock P. M., on the 18th day of October, 1889, for all the labor and material required to fix in place, complete, a low-pressure return-circulation, steam heating and ventilating apparatus, for the Court House and Postoffice, etc., building at Carson City, Nevada.

A decidedly novel and simple engine is manufactured by the Kimble Engine Co., Kalamazoo, Mich. It dispenses with piston rod, cross-head and ways, and is claimed to reduce friction to the lowest possible point. It has an oscillating piston sustained in a journaled bearing, and turns about one-fourth of a revolution to each stroke of the engine, the only friction outside of the shaft to which the rock cranks are attached being a slight pressure on the packing strips to keep it steam tight.

LYONS, France, is completing the world's biggest dam, begun a century ago. It is 1,000 feet long, 175 feet high and the foundations are 100 feet deep.

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TWO SPEED

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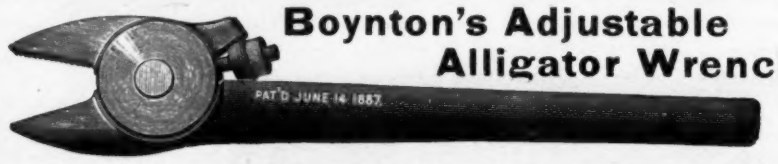

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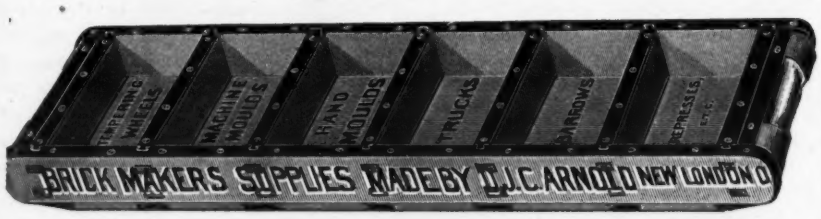

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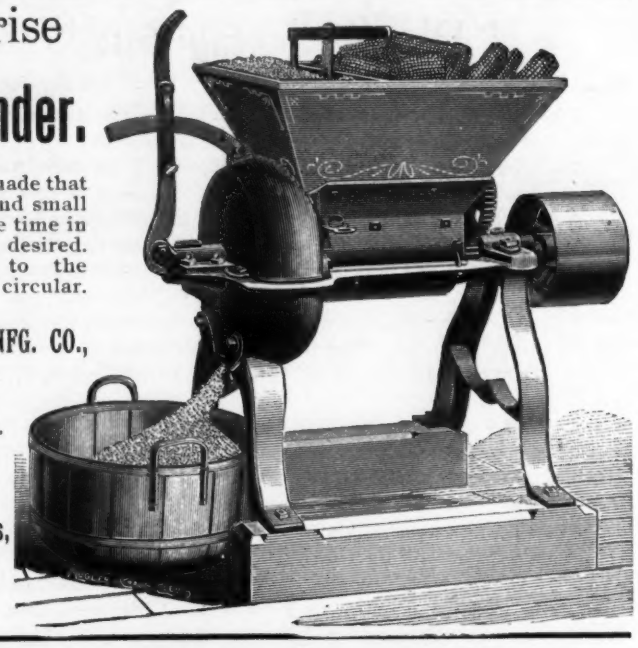

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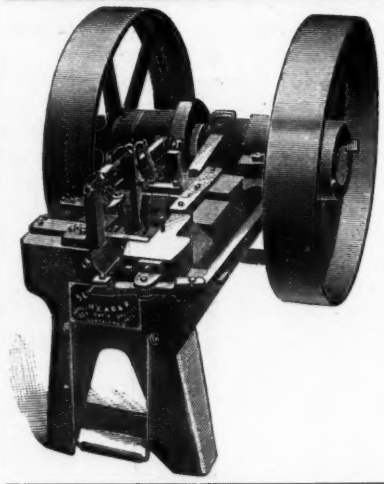

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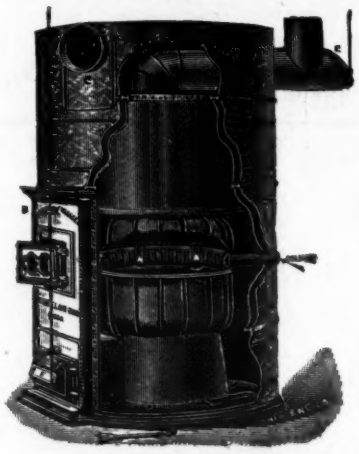

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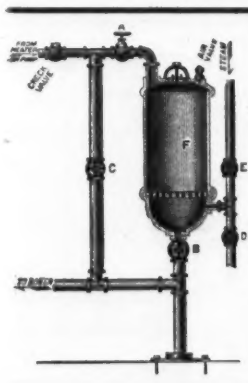

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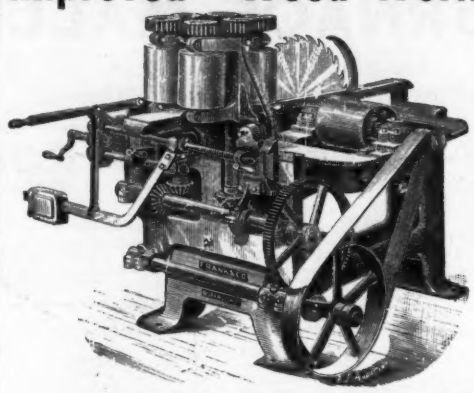

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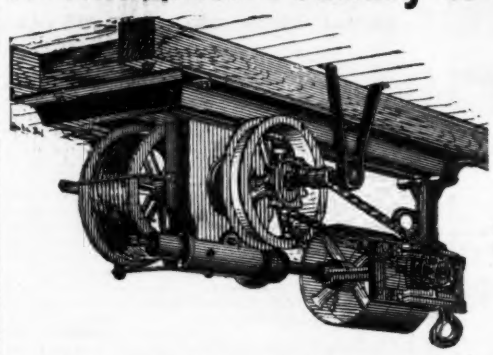

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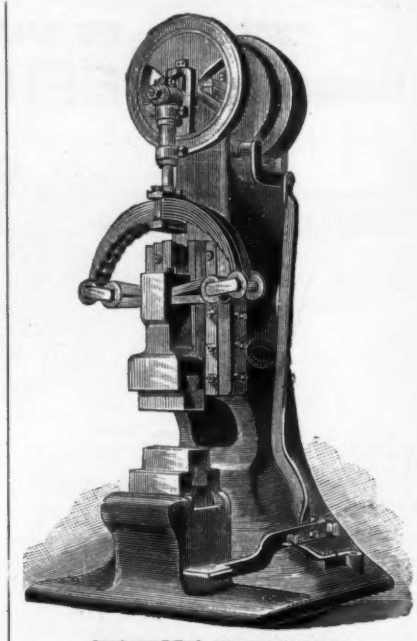

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CLEVELAND (f. o. b. cars, four months): Bessemer, $18 00@18 50; No. 1 Foundry, $17 15@17 65; No. 2 Foundry, $16 15@16 65; No. 1 Gray Forge, red short, $15 65@16 25; No. 2 Gray Forge, neutral, $15 15@15 65; No. 1 American Scotch, $18 40@19 05; No. 2 American Scotch, $17 40@18 05.

CHICAGO (reported by Rogers, Brown & Co.): COKE AND BITUMINOUS—Southern No. 1 Foundry, $16 75@17 00; Southern No. 2 Foundry, $16 25@16 50; Southern No. 3 Foundry, $15 50@15 75; Southern No. 1 Softener, $16 25@16 50; Southern Gray Forge, $15 25@15 50; Southern Mottled, $14 50@15 00; Ohio, Jackson Co. Silveries No. 1, $18 00@00 00; Ohio Jackson Co. Silveries No. 2, $17 00@00 00; Hocking Valley Silveries No. 1, $17 75@18 00; Hocking Valley Silveries No. 2, $16 75@17 00; Norton Kentucky Silveries No. 1, $17 75@18 00; Norton Kentucky Silveries No. 2, $16 75@00 00; Ohio Strong Softeners No. 1, $18 25@18 50; Ohio Strong Softeners No. 2, $17 25@17 50; Hamilton, Hanging Rock, all ore No. 1, 18 25@18 25; Hamilton Hanging Rock, all ore No. 2 17 25@17 75. LAKE SUPERIOR AND SOUTHERN CHARCOAL FOUNDRY—Lake Superior Charcoal Nos. 1 & 2, $19 00@19 50; Alabama Charcoal Nos. 1 & 2, $22 00@23 00; Tennessee Charcoal No. 1, $18 50@19 00; Tennessee Charcoal No. 2, $17 50@18 00. MALLEABLE AND CAR WHEEL—Lake Superior Charcoal Nos. 1 to 6, $19 00@00 00; Southern Alabama Nos. 1 to 6, $22 00@24 00; Tennessee Nos. 1 to 6, $18 50@19 00; Hanging Rock Warm Blast Nos. 1 to 6, $22 00@24 00; Hanging Rock Cold Blast Nos. 1 to 6, $26 00@28 00; Southern Cold Blast Nos. 1 to 6, 26 00@26 50.

CINCINNATI (reported by Rogers, Brown & Co.): HOT BLAST FOUNDRY—Ohio and SouthernCoke No. 1, $15 50@15 75; Ohio and Southern Coke No. 2, $15 00@15 25; Ohio and Southern Coke No. 3, $14 50@14 75; Ohio Soft Stone Coal No. 1, $16 25@16 75; Ohio Soft Stone Coal No. 2, $15 25@15 75; Hanging Rock Charcoal No. 1, $20 00@22 00; Hanging Rock Charcoal No. 2, $19 00@21 50; Tennessee and Alabamba Charcoal No. 1, $17 50@18 50; Tennessee and Alabama Charcoal No. 2, $16 50@17 50. FORGE—Strong Neutral Coke, $14 25@14 50; Mottled Neutral Coke, $13 50@00 00; Cold Short Coke, $14 00@00 00. CAR WHEEL AND MALLEABLE—Southern Car Wheel, $23 00@24 00; Hanging Rock Cold Blast, $22 00@25 00; Lake Superior Malleable and Car Wheel, $20 00@21 00.

LOUISVILLE (reported by Geo. H. Hull & Co.): Southern Coke No. 1 Foundry (new classification), $15 00@15 50; Southern Coke No. 2 Foundry (new classification), $14 50@15 00; Southern Coke No. 3 Foundry (new classification), $13 75@14 25; Grey Forge, $13 25@13 75; White and Mottled, different grades, $12 75@13 25; Silver Grey, different grades, $13 25@13 75; Southern Charcoal No. 1 Foundry, $16 50@17 00; Southern Charcoal No. 1 Mill, $15 00@15 50; Southern Car Wheel, Standard Brands, $22 00@23 00; Southern Car Wheel, other brands, $18 25@19 75; Hanging Rock Coke No. 1 Foundry, $15 75@16 25; Hanging Rock Charcoal No. 1 Foundry, $19 75@20 25; Hanging Rock Cold Blast, $21 00@23 00; Hanging Rock Warm Blast, $00 00@00 00.

LOUISVILLE (reported by Hall Bros. & Co.): HOT BLAST FOUNDRY—Southern coke No. 1, $15 00@15 50; Southern coke No. 2, $14 50@15 00; Southern coke No. 3, $13 75@14 25; Mahoning Valley (Lake ore mixtures), $18 00@18 50; Southern charcoal, No. 1, $17 00@17 50; Southern charcoal, No 2, $16 50@17 00; Missouri charcoal, No 1, $18 00@18 50; Missouri charcoal, No. 2, $17 50@18 00 FORGE—Neutral coke, $13 50@13 75; Cold short, $13 50@13 75; Mottled, $12 75@13 00. CAR WHEEL AND MALLEABLE—Southern (standard brands), $23 00@23 50; Southern (other brands), $18 00@18 50; Lake Superior, $22 00@22 50.

ST. LOUIS (reported by Rogers, Meacham & Shields): HOT BLAST COKE AND CHARCOAL—Southern Coke No. 1, $16 00@16 50; Southern Coke No. 2, $15 25@15 75; Southern Coke No. 3, $15 00@15 25; Southern Grey Forge, $14 50@14 75; Southern Charcoal No. 1, $18 00@18 50; Southern Charcoal No. 2, $17 00@17 50; Missouri Charcoal No. 1, $17 00@17 50; Missouri Charcoal No. 2, $16 00@16 50; Ohio Softeners, $18 00@20 00. CAR WHEEL AND MALLEABLE IRONS—Lake Superior, $20 50@22 00; Southern, $19 00@23 00. CONNELLSVILLE COKE—East St. Louis, $4 85; St. Louis, $5 00.

BUFFALO (reported by Rogers, Brown & Co.): Mahoning and Shenango Valley strong, No. 1 Foundry, $17 50@17 75; Mahoning and Shenango Valley strong, No. 2 Foundry, $16 50 $17 75; Niagara No. 1, $17 50@00 00; Niagara No. 2, $16 50@00 00; Niagara No. 3, $15 75 @00 00; Ohio Softeners No. 1, $17 50@18 00; Ohio Softeners No. 2, $16 50@17 00; Southern Softeners No. 1, $17 00@17 25; Southern Softeners No. 2, $16 00@16 25; Lake Superior Charcoal, $19 00@20 00; Alabama Car Wheel, $24 00@25 00; Hanging Rock Charcoal, $23 00@24 00.

DETROIT (reported by William F. Jarvis & Co.): Lake Superior Charcoal, all Numbers, $19 25@19 75; Lake Superior Coke, all Ore, $18 50@19 50; Lake Superior Coke, Cinder Mixed, $17 50@18 50; Standard Ohio Black Band, $18 00@18 50; Southern No. 1, $17 00@17 50; Southern Gray Forge, $15 50@16 00; Southern Silvery, $16 50@17 00; Jackson County (Ohio) Silvery, $18 00@18 50; Old Wheels, $18 50@19 50; Old Iron Rails, 25 00@25 50.

PITTSBURGH (reported by A. H. Childs): No. 1 Foundry, $17 50@18 00; No. 2 Foundry, $16 50@17 00; Grey Forge, $15 75@16 00; White and Mottled, $14 50@15 00; Warm Blast Charcoal, $18 00@25 00; Cold Blast Charcoal, $24 00@ 8 00; Bessemer, $18 50@19 00.

MERCHANT IRON AND STEEL.

Flat Bar.

1½ to 4 by ⅜ to 1 inch	1 80
4½ to 6 by ⅜ to 1 inch	1 90
1¾ to 6 by 1⅛ to 2 inch	2 20
1¼ & 1⅜ by ⅜ to ¾ inch	1 90
1 & 1⅛ by ⅜ to ¾ inch	1 90
⅝ ¼ and ⅞ by ⅜ to ⅝ inch	2 30

Round and Square.

1 to 1⅜ inch	1 80
2 to 2⅝ inch	2 00
2¼ to 3¼ inch	2 30
3⅜ to 4 inch	2 50
4¼ to 4½ inch	3 30
4¾ to 5 inch	3 50

Oval.

⅞ to 1¼ inch	2 20
⅜ to ¾ inch	2 40
½	2 60
⅞	3 00

Half Oval and Half Round.

1½ to 3 inch	2 90
⅞ to 1¼ inch	2 50
⅜ to ¾ inch	3 00
½	3 30
⅞	4 80

Heavy Band.

½ to 6 by ¼ and 5-16 inch	1 95
to 1¾ by ¼ and 5-16 inch	2 05
¾ to ⅞ by ¼ and 5-16 inch	2 25
½ to ⅝ by ¼ and 5-16 inch	2 75

Hoops.

1¾ to 4, Nos. 13 to 15	2 65
1¾ to 2, Nos. 16 to 18	2 75
1¾ to 2, No. 19	2 85
1¾ to 2, No. 20	2 95
1¾ to 2, No. 21	3 05
1¾ to 2, No. 22	3 15
15-16, 1 and 1⅛, Nos. 13 to 15	2 85
15-16, 1 and 1⅛, Nos. 16 to 18	2 95
15-16, 1 and 1⅛, Nos. 19 and 20	3 05
15-16, 1 and 1⅛, No. 21	3 15
15-16, 1 and 1⅛, No. 22	3 35
⅞, Nos. 13 to 15	2 05
⅞, Nos. 16 to 18	2 15
⅞, Nos. 19 and 20	2 25
⅞, No. 21	3 35
⅞, No. 22	3 45
13-16, Nos. 13 to 15	3 25
13-16, Nos. 16 to 18	3 35
13-16, Nos. 19 and 20	3 45
13-16, No. 21	3 55
13-16, No. 22	3 65
¾, Nos. 13 to 15	3 35
¾, Nos. 16 to 18	3 45
¾, Nos. 19 and 20	3 55
¾, No. 21	3 65
¾, No. 22	3 75
11-16, Nos. 13 to 15	3 55
11-16, Nos. 16 to 18	3 65
11-16, Nos. 19 and 20	3 75
11-16, No. 21	3 85
11-16, No. 22	3 95
⅝, Nos. 13 to 15	4 05
⅝, Nos 16 to 18	3 85
⅝, Nos. 19 and 20	4 05
⅝, No. 21	4 15
⅝, No. 22	4 25
⅝, No. 23	4 35

Light Band.

1½ to 6 by ⅛ to 3-16 in	2 25
1½ to 6 by Nos. 11 and 12	2 35
1 to 1¾ by ⅛ to 3-16 in	2 35
1 to 1¾ by Nos. 11 and 12	2 45
⅞ and 13-16 by ⅛ to 3-16 in	2 65
⅞ and 13-16 by Nos. 11 and 12	2 75
¾ and 11-16 by ⅛ to 3-16 in	2 95
¾ and 11-16 by Nos. 11 and 12	3 05
⅝ and 9-16 by ⅛ to 3-16 in.	3 25
⅝ and 9-16 by Nos. 11 and 12	3 30
½ by ⅜ to 3-16 in	3 50
½ by Nos. 11 and 12	3 60

Wagon Box Iron.

⅞ inch, beveled edge, by Nos. 11 and 12	2 75
⅞ inch, " " " 13 and 14	3 05
¾ inch, " " " 11 and 12	3 05
¾ inch, " " " 13 and 14	3 25

Sheet Iron.

No. 10 to 14	2 60
No. 15 to 17	2 80
No. 18 to 21	2 90
No. 22 to 24	3 00
No. 25 to 26	3 10
No. 27	3 20
No. 28	3 40

Iron Boiler Plates.

Tank, ¼ inch and heavier	2 40
C No. 1, " "	2 65
C H No. 1 " "	2 90
C H Flange, " "	3 60
Extra Flange, "	4 00
Solid Fire Box, "	4 90

Steel Boiler Plates—1-4 in. and Heavier.

Tank	2 65
Shell	3 05
Flange	3 30
Marine Flange	3 80
Fire Box	4 45

Above includes plates 90 inches wide.

90 to 96 in. wide	½c ℔ extra
96 to 100 in. wide	1 c "
100 to 104 in. wide	1½c "
104 to 116 in. wide	special

American Cast Tool Steel.

ROUND, SQUARE AND OCTAGON.	cts. ℔s
1 to 2 in. inclusive	09
9-16 to ½ in "	09
7-16 to ⅜ and 2⅜ to 3 in	10½
3⅛ to 4 in	11
⅜ to 11-16 and 4⅛	10½
⅛ to 6 in	11½
¼ to 9-32 and 6⅛ to 7 in	12
3-6 in	14

Flats.

	cts. ℔s
2 to 9-16 wide by 2 to ⅛ thick	0

CLEVELAND ROLLING MILL CO.,

MANUFACTURERS OF

BESSEMER STEEL RAILS,

Blooms and Billets, Steel Angles, Forgings, Bar and Spring Steel, Steel Street Rails, Steel O Barrel Hoops, Wire of all Kinds, Iron and Steel Boiler Plates, Galvanized and Black Sheet Iron, Corrugated Iron Roofing, Sheet Steel.

Bessemer and O. H. Steel.

	ct. ℔
Machinery	base price, 02¼
Tire	" 02¾
Spring	" 03¼
Sleigh Shoe	" 02¾
Toe Calk	" 03
Cutter Shoes, tapered and burr.	" 03

English Tool Steel.

Jessop's	16c
Hobson's "Best"	16c
" "Choice"	36c

Burden Boiler Rivets.

½, ⅝, 11-16 and ¾ inches diameter	4 00
Bridge ½, ⅝, 11-16 and ¾ inch diam	4 00

SCRAP IRON AND OLD METAL.

	NET TONS
No. 1 R. R. wrought scrap	$17 50
No. 1 wrought scrap	15 50
No. 1 Machine cast scrap	12 50
Stove Plate (free from burnt iron)	9 50
Grate Bars	8 50
Pipes and flues (Clean)	12 75
Tank iron	12 50
Hoop and band iron	9 50
Sheet iron	8 00
Iron axles	23 00
Axle turnings	13 00
Wrought turning (free from cast)	11 50
Wrought drillings	11 00
Cast borings	8 50
Malleable iron	9 50
Uncut wrought iron boilers	10 00
Steel boiler plates	10 00
	GROSS TONS
Old iron T rails	22 00
Old steel rails	17 00
Old car wheels	17 00
Old copper	℔ 10
No. 1 H. red Brass	11
Heavy yellow brass	8½
Light yellow brass	6
Scrap Zinc	
Tea Lead	
Heavy Lead	3¼

DALLIBA, CORRIGAN & CO.,

DEALERS IN

Iron Ore & Pig Iron.

101 St. Clair St., Rooms 20 to 22,

CLEVELAND, O.

TUTTLE, OGLEBAY & CO.,

Commission Dealers in

Iron - Ores.

FROM MARQUETTE, GOGEBIC AND MENOMINEE DISTRICTS,

CLEVELAND, OHIO.

J. H. OUTHWAITE. W. G. POLLOCK.

J. H. OUTHWAITE & CO.,

Exclusive attention given to

LAKE SUPERIOR AND MENOMINEE RANGE

Iron Ore.

Perry-Payne B'ld'g, Cleveland, O.

CONDIT, FULLER & CO.,

Pig and Bar Iron,

CLEVELAND, OHIO.

Pickands, Mather & Co.,

IRON ORE - -

—AND—

- - PIG IRON

Corner Bank and Superior Streets,

CLEVELAND, O.

H. P. Hussey. Geo. H. Pomeroy.

HUSSEY & POMEROY,

EXCLUSIVELY PIG IRON,

Strong Foundry and American Scotch Irons, Gray Forge and Bessemer Irons for steel purposes.

Room 57, Grand Arcade, Cleveland, O.

PITTSBURGH & WHEELING COAL CO.,

MINERS AND SHIPPERS OF

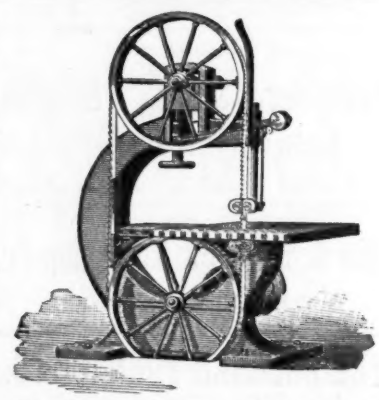
Ohio Steam Coal and Coke.

Mines on the Cleveland, Lorain & Wheeling R. R. Capacity, 3,000 tons daily.

Office, 29 Mercantile Bank Building, CLEVELAND, OHIO.

Lake Shipping Point, Lorain O.

JAS. PATTERSON, Sales Agent.



$80 will buy the best No. 1 band saw in the world

$100 will buy our new No. 2 band saw.

$185 will buy our new patent band re-sawing machine.

$100 will buy the best No. 1 automatic rip-sawing machine. Weatherboarding attachment included, and one 12-inch rip saw.

$125 our new No. 2 complete as above.

For further particulars address

STANDARD MFG. CO.,

118-140 Main St., Edinburg, Ind.

E. A. SCHUMACHER,

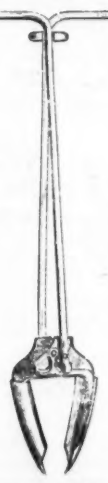
MANUFACTURER OF

Upright - Drills,

28-30 WEBSTER ST., CINCINNATI, O.

S. M. York, Agent for Cleveland, O.

THE GEM POST HOLE AUGER.



THE

LATEST AND BEST

on the market. This Auger

Bores Rapidly

AND IS

Easily Operated.

It will open wide when dumping the dirt, which may be entirely removed from the hole, whether wet or dry, fine or coarse, by closing blades.

Send for Price List and Circulars.

J. H. OSBORNE & CO.

Manufacturers,

UNION CITY, IND.

LABORATORY

—OF—

CHEMISTRY - AND - PHYSICS.

Tests of Ores and Strengths of Material requiring expert work a specialty. Address,

J. F. ELSOM,

New Albany, Indiana.

MACHINERY SUPPLY MARKET.

Anvils.

American.....₩ lb 9@10
Wrights.....₩ lb 9½

Bellows.

Blacksmiths' { Hill's.....dis 40 / Bullock's.... dis 50&10
Moulders'.....dis 40@40&10
Hand.....dis 40&10@50

Belting.

Boston Belting Co's standard.....dis 70@70& 5
" " " extra.....dis 60&5@60&10
" " " best.....dis 55
Hoyt's Short Lap.....dis 45
Cleveland Rubber Co. extra standard.dis 60&10
Shultz Raw Hide Leather Belting, single.....dis 30
Shultz Raw Hide Leather Belting, double.....dis 35
Standard, oak tanned.....dis 55@60
Alexander Brothers' pure oak tanned. ...dis 45

Blowers and Exhausters.

B. F. Sturtevant's.....dis 20
Boston Blower Co.,.....dis 35
Buffalo.....dis 35

Borax.

.....₩ lb 9½@10½

Chalk.

White .....₩ gross 50
White Crayon.....₩ gross 12@12½ dis 10
Red.....dis 70
Blue.....dis 85

Chucks.

Cushman's 4 Jaw Independent.....dis 40
" Combination.....dis 40
" Geared Scroll.....dis 30
" 2 Jaw Brass Workers .....dis 25
" Drill.....dis 35
Wescott's Scroll Combination.....dis 30
" Independent.....dis 40
" Little Grant Drill.....dis 30
Horton's Universal & Ind.....dis 40
National Combination.....dis 40
Sweetland " .....dis 40
Skinner " .....dis 40
" Independent.....dis 40
Almond Drill.....dis 25
Morse " .....dis 15
Skinner " .....dis 30

Cutters and Reamers.

Cleveland.....dis 10@15
Pratt & Whitney.....dis 10@15
Standard.....dis 10@15
Brown & Sharpe, Milling Cutters.....dis 15
" " Gear Cutters.....dis 15

Crowbars.

Cast Steel.....₩ lb 4
Iron, steel points.....₩ lb 3½

Drill and Drill Stocks.

Twist drills.....dis 50&10
Morse Taper and Straight shank to 1½".....dis 50&10
Morse Taper and Straight shank Larger than 1½".....dis 25
Drill Sockets.....dis 25
Standard.....dis 50&10
Cleveland.....dis 50&10
Maneer's bench.....dis 50&25
Maneer's post.....dis 50&10

Emery.

	No. 4 to 46 gr.	No. 54 to 150. gr.	Flour, F.	C. F. FF.
Kegs, ₩ lb	4 c	5 c		2½c
½ kegs ₩ lb	4¼c	5¼c		2¾c
¼ kegs ₩ lb	4½c	5½c		3 c
10 lb cans, 10 in case	6 c	6½c		5 c
10 lb cans, less than 10	10 c	10 c		7½c

Emery Cloth and Paper.

Barder, Adamson & Co.....dis 40@46
H. H. Barton.....dis 40@46

Emery Wheels.

Detroit.....dis 50@60
Norton's.....dis 55@60
Grant.....dis 55@60
Union Stone.....dis 60
Sterling.....dis 60
Vulcanite.....dis 15@20
Celluloid.....dis 10
Northampton.....dis 55
Crystal.....dis 65@70
Vitrified.....dis 60

Files.

Nicholson.....dis 60&10@60&10&10
" X. F.....dis 25
Kearney & Foot.....dis 60&10@60&10&10
Black Diamond.....dis 60&10@60&10&10
Arcade.....dis 65@70
Disston's.....dis 65@70
Western.....dis 70
Stub's.....dis 25
Grobet's.....dis 30
Reynolds Bros.' Hand Cut.....dis 50

Hammers.

P. S. W.....dis 40
Atha new list, Jan. 15, 1887.....dis 50
Heavy hammers and sledges under 5 lbs. 18c over 5 lbs 14c, new list.

Jack Screws.

Illinois Bolt Co. list.....dis 70

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4¼	4	3¾	3⅛
Hexagon	15½	11½	8½	6	5¾	5¼	5
Washers	9	8	7	5	4½	4¼	4¼

In lots less than 100 lbs, ₩ lb add ½c., 1 lb boxes add 1c to list.

Nails (wire.)

List July 14, 1887.....dis 70 &10
Standard Penny Nails, ₩ keg card rate { Car lots.....$2.30 / Less than car lots $2 40

Oilers.

Zinc and Tin.....dis 60
Brass and Copper.....dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ₩ doz.....dis 10@10&10

Packing, Steam.

Boston Belting Co.....dis 60
American Packing Hemp.....₩ lb 10@11
Russia Packing " .....₩ lb 14
Italian Packing " .....₩ lb 13@14
Plumbago Piston.....₩ lb 40
Morrison's " .....₩ lb 50
Square Flax " .....₩ lb 70
Sheet Rubber.....₩ lb 12@24
Excelsior Rubber.....₩ lb 48

Picks.

Railroads, 5 to 6 lbs.....$12 dis 60
" 6 to 7 lbs.....$13 dis 60

Pulleys.

Iron Pulleys, Walker List.....dis 45
Medart Pulleys.....dis 55
Split Wood Pulleys.....dis 45

Rivets.

Iron, Thousand, list November 17, ...dis 50
Iron, Ordinary, Cooper's Block and Carriage list November 17.....dis 50
Copper.....dis 50@50&10

Rope.

Manilla, ½ inch and over.....₩ lb 15¼
Sisal, ½ inch and over .....₩ lb 13¼

Sand Paper.

B. A. & Co.....dis 40@40&10
H. H. Barton's.....dis 40@40&10
New England Flint.....dis 40@40&10
Barton's Garnet.....dis 25

Saws.

Disston's Circular.....dis 45
" Band.....dis 20
" Scroll .....Net
Hack Saw Stubs.....dis 20
" " Eureka.....dis 20
" " Star.....dis 20
Saw Swages Disston's.....dis 20
Atkins' Circular Saws.....dis 50
" Mill, Mulay and Drag Saws..dis 40&10
" Wood Saws.....dis 40&10
" Silver Steel Diamond Cross-cut Saws.....dis 70c per ft
" Dexter Cross-cuts.....dis 50c "
" Diamond " .....dis 30c "
" Tuttle Tooth Cross-cuts..dis 25c "
" One-man Cross-cuts.....dis 32c "
No. 1 Handles.....dis 25c per pair
No. 6 " .....dis 16c "
Excelsior Saw Tools.....$6 per doz
Perfection " .....$15 "
Detroit Saw Works, Circular.....dis 50
" " " Band.....dis 25
" " " Mulay.....dis 45

Screws.

Wood Screws—List Jan 27, 1889.

Flat head iron.....dis 50
Round head iron.....dis 40
Flat head brass.....dis 45
Round head brass.....dis 35
Square Cap.....dis 65
Hexagon Cap.....dis 60
Set C. H. C. P.....dis 70
Machine, flat head, iron.....dis 55
Machine, round head, iron.....dis 50
Bench and hand—
Lag or coach.....dis 75@75&10
Coach, patent gimlet point.....dis 75

Shovels and Spades.

Ames' list November 1, 1885.....dis 20
Dennis.....dis 5.25
Hussey & Binns, railroad.....dis 8.00

Taps.

Cards, Hand and Nut to 2 in.....dis 50
Carpenters' " " " .....dis 50
Morse " " " .....dis 50
Pratt & Whitney " " new list dis 10
Machine Screw Taps.....dis 55
Pipe Taps to 2½ in.....dis 70
Stay Bolt Taps.....dis 25
Stove Bolt Taps.....dis 50
Pulley Taps.....dis 40

Twine.

	BC.	B.
No. 12, Flax Twine, ¼ and ⅛ lb Balls	21c@29c	
No. 18 " " ¼ and ⅛ "	18c@28c	
No. 36 " " ¼ and ⅛ "	16c@27c	
2-Ply Hemp, ¼ & ⅛ lb Balls (Spring Twine)	11½c	
3-Ply " 1 lb Balls	12@12½c	
3-Ply " 1½ lb Balls	11@11¼c	
Cotton Wrapping, 5 Balls to lb	15@16c	

Vises.

Solid Box.....dis 60
Parker's.....dis 20@25
Prentiss.....dis 20
Stephen's.....dis 25@30
Barrett's.....dis 30
Miller's Falls.....dis 40
Merrill's.....dis 10@15
Howard.....dis 30
Maneer's machinist.....dis 50&10

Wire.

New List, Jan. 18, 1884

Brass and copper.....dis 20@25
Bright and annealed, Nos. 0@18...dis 70&10@75
" " Nos. 19@26..dis 75@75& 5
" " Nos. 27@36..dis 75&10& 5
Coppered Nos. 0 to 18, market list..dis 70@70& 5
Galvanized Nos. 0 to 18 " ".....dis 65&5
Tinned market Nos. 0 to 18.....dis 67½
Cast steel.....dis 50
Tinned Broom Wire.....dis 70&5@70&10
Annealed Fence, Nos. 8 and 9.....dis 75
Annealed Grape, Nos. 10 to 14.....dis 75
Stub's Steel Wire regular.....$6.00@lb dis 30

Wrenches.

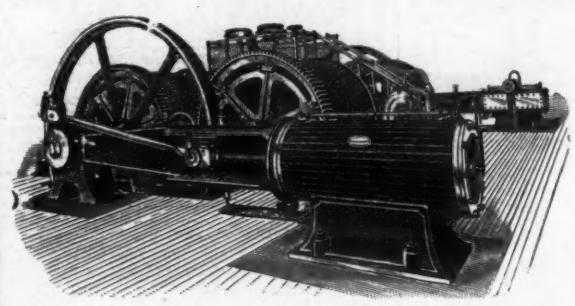
Coe's genuine, cash in ten days.....dis 50
Girard Standard.....dis 70&10
Agricultural.....dis 75&10
Mechanics'.....dis 55&10,& 3
Bemis & Call's Combination .....dis 35
Donohue's Engineers.....dis 20&10
Lamson & Sessions Engineers.....dis 60
Billings & Spencer's Drop Forged.....dis 10
William's " " .....dis 10
Alligator " " .....dis 40

Sebastian, May & Co.'s

Improved Screw-Cutting FOOT or POWER LATHES.

Catalogue of Lathes, Dril Presses & Machinists' Tools and Supplies mailed on application. Lathes on Trial.
164 W. Second St., CINCINNATI, O.

Webster, Camp & Lane Machine Co.



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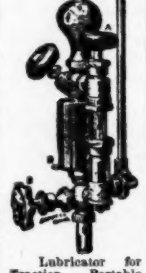

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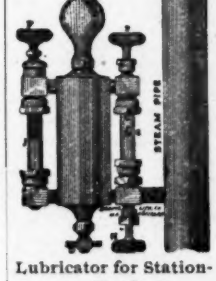

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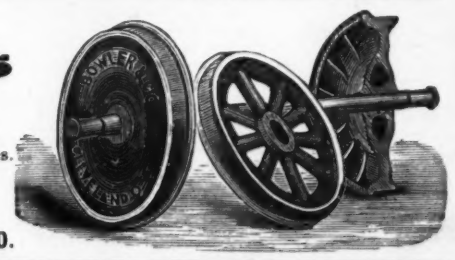

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Wrought iron square bolts.....dis 70@70&10
Wrought shutter bolts.....dis 60&10
Sargent's list
Carriage, common, new list.....dis 75&7½
Tire, common, new list.....dis 70
Carriage and tire, Philadelphia pattern.....dis 75&10
Stove bolts.....dis 62½
Plow bolts.....dis 60&5
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Fast joint, narrow.....dis 50&10&5@60&5
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Loose joint, jap.....dis 70&10@75
Loose joint, jap. with acorns.....dis 70&10@75
Loose pin, acorns.....dis 70&10@75
Loose pin, japanned acorns.....dis 70&10@75
Loose pin, acorns, jap. plated tips..dis 70&10@75
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Wrought, fast joint, broad.....dis 70&10@75
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Loose pin.....dis 70&10@75
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Paragon.....dis 40&10
Richard's.....dis 30@30&10

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	No.	10	9	8	7	6	
Ausable, ₱ lb.		23	24	25	26	28.	dis 25&10@25&10&10
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Bell pulls, genuine bronze.....dis 60&10
Lever bell pulls, genuine bronze.....dis 60&10
Butts', genuine bronze.....dis 60&10
Butts' bronze plated.....dis 60&10
Store door locks and latches.....dis 60&10
Store door handles.....dis 60&10
Shutter hinges&flaps,genuine bronze.dis 60&10
Shutter hinges, bronze plated.....dis 70
Flush bolts, genuine bronze.....dis 70
Shutter knobs, genuine bronze.....dis 50
Shutter bars, genuine bronze.....dis 60
Sash lifts, genuine bronze.....dis 60
Sash pulls and plates, genuine bronze.....dis 60
Push plates, genuine bronze.....dis 60
Drawer pull, genuine bronze.....dis 66⅔
Letter box plates, genuine bronze....dis 60&10
Barn door locks.....dis 33⅓

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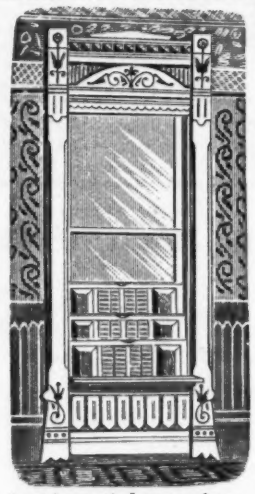
New List, January 2, 1888.
American iron carpet tacks all kinds.....dis 80@80&5
Steel carpet tacks all kinds.....dis 80@80&5
Swedes iron carpet tacks, all kinds.....dis 80@80&5
Swedes iron tacks.....dis 75&5@75&10
Swedes iron Upholsterers' tacks.....dis 75&10@75&10&5
Tinned Swedes iron tacks..dis 75&10@75&10&5
Tinned Swedes iron Upholsterers' tacks.....dis 75&10@75&10&5
American iron cut tacks.....dis 75@75&10
Copper tacks.....dis 50&10
Copper finishing and trunk nails.....dis 50&10
Cigar box nails.....dis 50&10@50&10&5
Finishing nails.....dis 70&10@70&10&10
Hungarian nails and miners' tacks.....dis 70&10@70&10&10
Gimp and lace tacks.....dis 75&10@75&10&5
" " " tinned.dis 75&10@75&10&5
Trunk and clout nails.....dis 70&10@70&10&10
Tinned trunk&clout nails.dis 70&10@70&10&10
Basket nails.....dis 70&10@70&10&10
Chair nails.....dis 70&10@70&10&10
Common and patent brads.dis 70&10@70&10&10
Tinned capped trunk n'ls..dis 70&10@70&10&10

Hartman's Patent Inside Sliding Window Blind



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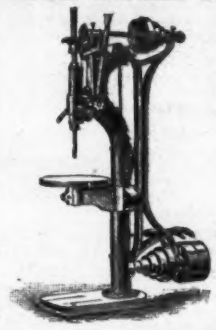

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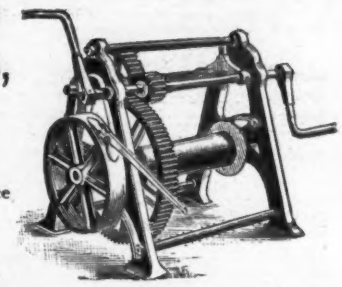

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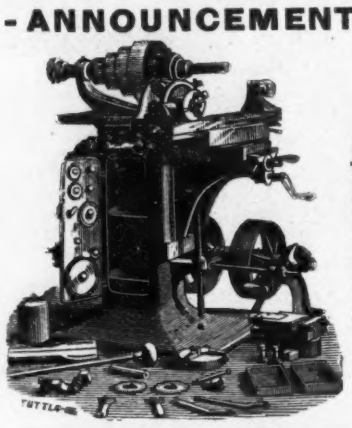

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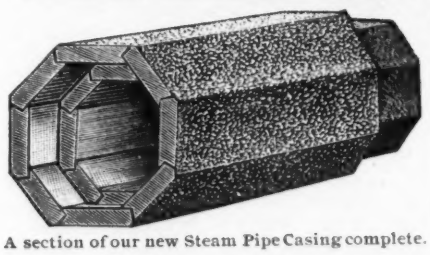

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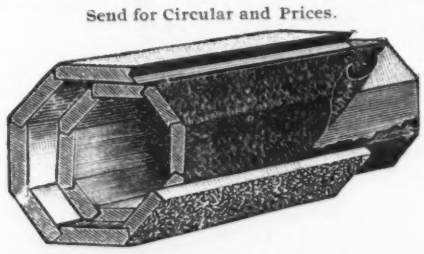

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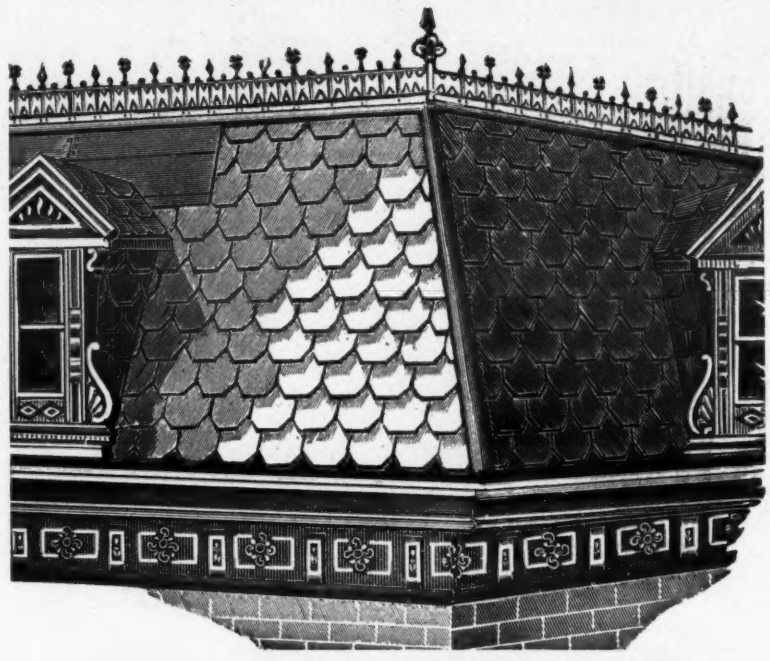

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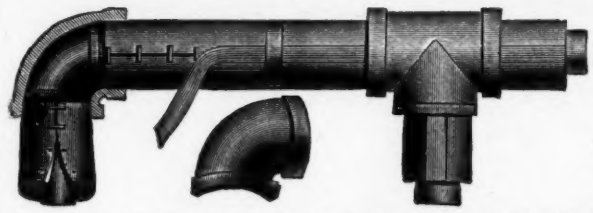

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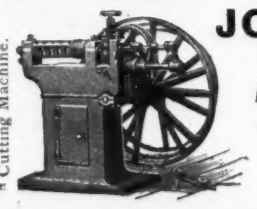

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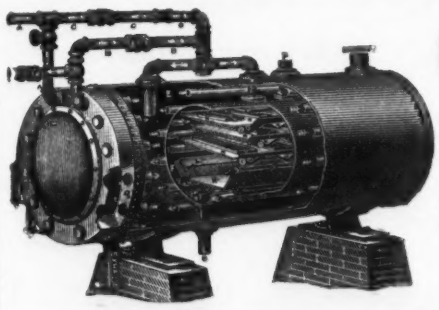

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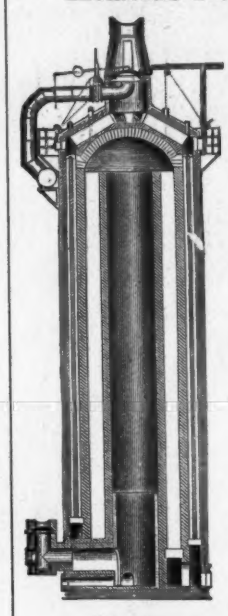

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Sole agents for

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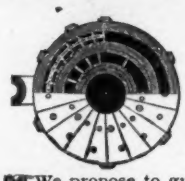

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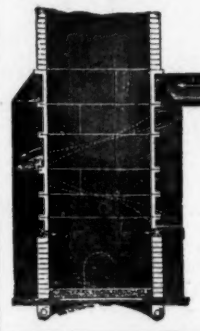

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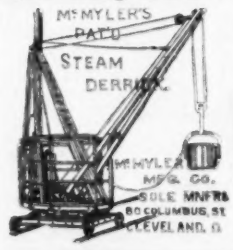

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Classified List of Advertisers.

The star (*) indicates that the adv. appears alternate weeks; the dagger (†) once a month; the double dagger (‡) irregularly.

PAGE.

Animal Pokes—
A. W. Bishop, Berea, O..... 15
Bath Tubs—
*Michigan Bath Tub Co., Homer, Mich.... 11
Blowers—
Buffalo Forge Co., Buffalo, N. Y..... 19
Boring Machines—
*J. H. Osborne & Co., Union City, Ind..... 10
Bolts and Bolt Machinery—
Hotchkiss & Upson Co., Cleveland 16
Colwell & Collins, Norway Bolt Co., Cleveland..... 16
*Seaton Mfg. Co., Cleveland..... 10
Brick and Tile Machines—
D. J. C. Arnold, New London, O..... 10
*Stevenson & Co., Wellsville, O. ..... —
Beltings—
Parkin & Bosworth, Cleveland..... 20
Belt Holders—
*W. R. Santley & Co., Wellington, O..... —
Boilers and Boiler Attachments—
J. C. McNeil & Co., Akron, O..... 15
Enterprise Boiler Co., Youngstown, O..... 16
Unique Lubricator Co., Mansfield, O..... 13
Columbia Injector Co., Cleveland..... 15
Penberthy Injector Co., Detroit, Mich..... 20
Detroit Lubricator Co. Detroit, Mich..... 16
Wm. B. Pollock & Co., Youngstown, O..... 18
Alliance Steam Boiler Works, Alliance, O 16
H. T. Sackett & Co., Fond du Lac, Wis..... 11
Bolt Cutters—
H. B. Brown & Co., East Hampton, Ct..... 17
Burglar Alarms—
Cuyahoga Manufacturing Co., Cleveland.. 11
Car Axles—
B. Barrett's Sons & Co., Wooster, O..... 14
Coal and Coke—
Pittsburgh & Wheeling Coal Co., Cleveland..... 12
Coal Sieves—
Lock Haven Sifter Co., Lock Haven, Pa... 14
Cranes and Derricks—
McMyler Manufacturing Co., Cleveland..... 15
Wm. Tod & Co., Youngstown, O. 18
Harmar Foundry & Machine Co, Harmar, O..... 18
Car Wheels—
Bowler & Co., Cleveland..... 13
Chemical Laboratory—
J. F. Elsom, New Albany, Ind..... 12
Clothes Bars—
Hulet, Holmes & Co., Berea, O..... 14
Damper Regulators—
*Curtis Regulator Co., Boston, Mass..... 19
Die Makers.
Avery Stamping Co., Cleveland..... 13
Door Hangers—
Taylor and Boggis Fdy. Co., Cleveland..... 20
Drilling Machines—
Universal Radial Drill Co., Cincinnati, O.. 15
*E. A. Schumacher, Cincinnati, O..... 12
Huntington & Lunt, Cleveland..... 14
*Lodge, Davis & Co., Cincinnati, O..... 20
W. F. & John Barnes' Co., Rockford, Ills.. 18
Drop Presses—
Williams, White & Co., Moline, Ill..... 12
Engineers and Contractors—
E. H. Jones & Co., Cleveland..... 18
Jas. P. Witherow, Pittsburgh, Pa..... 10
McClure & Schuler, Pittsburgh, Pa..... 15
Elevators—
L. S. Graves & Co., Rochester, N. Y..... 11
Houghton Foundry & Machine Co., Toledo, O..... 11
Explosives—
Hercules Powder Co., Cleveland..... 19
Electric Lighting Apparatus—
Brush Electric Co., Cleveland..... 10
Elevator Buckets.
Avery Stamping Co., Cleveland..... 13
Emery Wheel Dressers—
W. W. Brisben, Cleveland..... 18
Emery Wheel Machinery—
J. Wendell Cole, M. E., Columbus, O., or Chicago, Ill..... 20
W. F. & John Barnes' Co., Rockford, Ill... 18
Engravers and Electrotypers—
Eclipse Electrotype & Engraving Co., Cleveland..... 14
Murray & Heiss, Cleveland..... 17
Union Electrotype Foundry, Cleveland.... 26
Engines (Steam)
Kilby Manufacturing Co., Cleveland..... 20
Novelty Iron Works, Canton, O..... 16
Aetna Machine Co., Warren, O..... 18
Wm. Tod & Co., Youngstown, O..... 18
E. H. Jones & Co., Cleveland..... 18
*Columbus Machine Co., Columbus, O..... —
*Chandler & Taylor Co., Indianapolis, Ind. 15
Buckeye Engine Co., Salem, O..... 19
The Westinghouse Machine Co., Pittsburgh, Pa..... 18
Geo. Worthington Co., Cleveland..... 18
Cleveland & Hardwick, Erie, Pa..... 18
Jas. Leffel & Co., Springfield, O..... 19
Engines (Gas)—
Schleicher, Schumm & Co., Philadelphia, Pa. and Chicago, Ill..... 18
Van Duzen Gas Engine Co., Cincinnati, O..... 18
Engineers' Specialties—
Crescent Manufacturing Co., Cleveland... 16
*Curtis Regulator Co., Boston, Mass..... 19
Ejectors—
James Jenks, Detroit, Mich..... 16
Files, Makers of—
Reynolds Bros., Columbus, O..... 20
A. & H. Gough, Cleveland..... 15
Flue Cleaners—
Crescent Manufacturing Co., Cleveland..... 16
Forges—
Buffalo Forge Co., Buffalo, N. Y..... 19
Cleveland City Forge & Iron Co., Cleveland 20
Foundries—
Bowler & Co., Cleveland.....13 & 16
Taylor & Boggis Foundry Co., Cleveland.. 16
Curry & Co., Meadville, Pa..... 16
Feed Water Heaters—
Stilwell & Bierce Manufacturing Co., Dayton, O..... 20
Laidlaw & Dunn Co., Cincinnati, O..... 19
Armstrong Bros., Springfield, O..... 15
E. H. Jones & Co., Cleveland..... 18
For Sale—
Foundries, Furnaces, Machinery, etc..... 16
Foundry Cupolas—
Victor Colliau, Detroit, Mich..... 15
Frost Proof Steam Traps—
*Curtis Regulator Co., Boston, Mass..... 19
Feed Grinders—
*Enterprise Mfg. Co., Columbiana, O..... 19
Galvanizers.
Avery Stamping Co., Cleveland..... 13
Hardware—
W. Bingham Hardware Co., Cleveland..16 & 14
Eberhard Manufacturing Co., Cleveland... 16
Geo. Worthington Co., Cleveland..... 18
Bronson Supply Co., Cleveland..... 20
Heating Furnaces—
Beecher Furnace Co., Cleveland..... 11
Hydraulic Jacks—
Philip S. Justice & Co., Philadelphia, Pa.. 11
Iron and Steel Roofing—
Sykes Iron Roofing Co., Niles, O..... 19
Cambridge Iron Roofing Co., Cambridge, Ohio..... 19
Garry Iron Roofing Co., Cleveland..... 19
Standard Iron Co., Bridgeport, O..... 19
Kanneberg Roofing Co., Canton, O..... 19
W. J. Burton & Co., Detroit, Mich..... 15
Thompson Manufacturing Co., Cleveland, 19
W. G. Hyndman & Co., Cincinnati, O..... 19
Scott & Co., Cincinnati, O..... 17
*Canton Steel Roofing Co., Canton, O..... 19
*Merchant & Co., Chicago, Ill..... —
Iron (Malleable)—
Sweet & Clark Co., Marion, Ind..... 12
Iron Ore, Bar and Pig Iron—
Dalliba, Corrigan & Co., Cleveland..... 12
Tuttle, Oglebay & Co., Cleveland..... 12
J. H. Outhwaite & Co., Cleveland..... 12
Condit, Fuller & Co., Cleveland, O..... 12
Pickands, Mather & Co., Cleveland....16 & 12
Hussey & Pomeroy, Cleveland..... 12
Iron Planers—
Smith & Silk, Cincinnati O..... 13
Lath Mills—
D. S. Abbott, Olean, N. Y..... 17
Lumber—
Martin & Barris, Cleveland..... 16
Lathes—
Muller Machine Co., Cincinnati, O..... 20
Sebastian, May & Co., Cincinnati, O..... 13
H. L. Shepard, Cincinnati, O..... 15
*Lodge, Davis & Co., Cincinnati, O..... 20
Mantels, Grates, Etc.—
Conger & Collins Mantel Co., Cleveland... 20
Milling Machines—
†Brown & Sharpe Mfg. Co., Providence, R.I. 10
Mining Machinery—
Webster, Camp & Lane Machine Co., Akron, O..... 13
Machinery—(General)
*Columbus Machine Co., Columbus, O..... —
Morgan Machine Co., Cleveland..... 17
Machinery (Foot Power)
W. F. & John Barnes' Co., Rockford, Ill... 18
Machine Shops—
Webster, Camp, & Lane Machine Co., Akron, O..... 16
Novelty Iron Works, Canton, O..... 16
Machinists' Tools and Supplies—
Parkin & Bosworth, Cleveland.....20 & 20
E. E. Garvin & Co., New York..... 15
Office Furniture—
Burgess Bros, Cleveland..... 17
Cleveland Desk Co., Cleveland..... 17
Patents—
Osborne & Co., Cleveland..... 16
E. H. Bates, Washington, D. C..... 10
J. B. Cralle & Co., Washington, D. C..... 10
Plumbers and Steam Fitters—
Parker & Meikle, Cleveland..... 19
Power Hammers—
Philip S. Justice & Co., Philadelphia, Pa.. 11
Pumps (Steam)—
E. H. Jones & Co., Cleveland..... 18
Laidlaw & Dunn Co., Cincinnati, O..... 18
Hamar Foundry & Machine Co., Hamar, O..... 18
Pumps (Chain)
S. E. Crawford, Norwalk, O..... 16
Paint—
Iron Clad Paint Co., Cleveland..... 15
Pipe Coverings—
John A. McConnell & Co., Pittsburgh..... 15
A. Wyckoff & Son,, Elmira, N. Y..... 15
Post Hole Augers—
*J. H. Osborne & Co., Union City, Ind..... 12
Printing Inks—
Ault & Wiborg, Cincinnati, O..... 17
Punching and Shearing Machine—
*Bertch & Co., Cambridge City, Ind..... —
Williams, White & Co., Moline, Ill..... 11
Cleveland Hardware Co., Cleveland..... 14
Railway Supplies—
Bowler & Co., Cleveland..... 13
Cleveland City Forge & Iron Co., Cleveland..... 20
Railroads—
Time Tables, Etc..... 17
Reducing Valves—
*Curtis Regulator Co., Boston, Mass..... 19
Sash Balances—
Caldwell Manuf'g Co., Rochester, N. Y..... 10
Steel Rails, Blooms and Billets—
Cleveland Rolling Mill Co., Cleveland..... 12
Steam Heating Apparatus—
*Curtis Regulator Co., Boston, Mass..... 19
A. A. Griffing Iron Co., Jersey City, N. J... 11
Steam Boiler Inspectors—
Hartford Steam Boiler Inspection & Insurance Co., Hartford, Conn..... 14
Type Founders—
Franklin Type Foundry, Cincinnati, O... 17
Steel Stamps and Stencils—
F. H. Fleharty & Co., Cleveland..... 16
Saws—
Detroit Sow Works, Detroit, Mich..... 10
Northwestern Saw Works, Toledo, O..... 16
Peter Gerlach & Co., Cleveland..... 11
Shapers—
*Lodge, Davis & Co., Cincinnati, O..... 20
Sheet Iron—
Cleveland Rolling Mill Co., Cleveland. 12
Sheet Steel—
Standard Iron Co., Bridgeport, O..... 19
Split Pulleys—
Geo. Worthington Co., Cleveland 18
Steel Castings—
Chester Steel Casting Co., Philadelphia, Pa..... 13
Steam Fitters' Supplies—
A. A. Griffing Iron Co., Jersey City, N. J... 11
Stampers of Sheet Metal—
Avery Stamping Co., Cleveland..... 13
Tinning Steel, Etc.
Avery Stamping Co., Cleveland..... 13
Torches—
Schneider and Trenkamp Co., Cleveland. 11
Trucks and Wheelbarrows—
Lansing Wheelbarrow Co., Lansing, Mich..... 13
Twist Drills—
Cleveland Twist Drill Co., Cleveland..... 20
*Standard Tool Co., Cleveland..... —
Turnbuckles—
Cleveland City Forge & Iron Co., Cleveland..... 20
Water Columns—
Reliance Gauge Co., Cleveland..... 20
Window Blinds—
Hartman & Durstine, Wooster, O..... 14
Wire Goods—
F. Powell & Co., Toledo, O..... 20
Wire Machinery—
John Adt & Son, New Haven, Conn..... 15
Wood-Working Machinery—
D. S. Abbot, Olean, N. Y..... 17
Frank & Co., Buffalo, N. Y..... 11
Standard Mfg. Co., Moore's Hill, Ind..... 12
Wrenches—
Campbell Printing Press & Mfg. Co. New York..... 10

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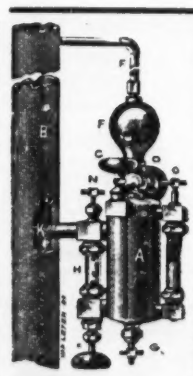

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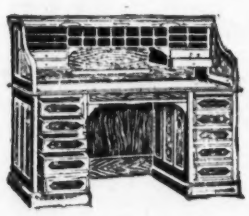

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Standard Time.

Revised March 6th, 1888.

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Eastward.	Arrive.	Depart.
Buffalo Passenger.....	10 40 a m	10 45 a m
Chicago Passenger.....	9 20 p m	.....
Local Freight.....	4 30 p m	.....
Westward.	**Arrive.**	**Depart.**
Chicago Passenger.....	.....	6.30 a m
Fostoria Passenger	5 06 p m	5 11 p m
Local Freight.....	1 00 p m	.....

Rocky River Accommodation departs 7:40 a. m.; 1:40 p. m.

Euclid Accommodation departs 6:20 a. m.; 4.55 p. m.

All trains daily, except Sunday.

Cleveland & Pittsburgh.

	Arrive.	Depart.
New York Express.....	12 50 p m	8 00 a m
New York Express.....	6 35 p m	1 05 p m
Alliance & Akron Accom.....	9 40 a m	3 25 p m
Ravenna Accommodation.....	8 25 a m	5 00 p m
Night Express.....	*5 25 a m	*11 10 p m

*Daily; all other trains daily, except Sunday.

Mt. Vernon & Pan Handle Route.

C., A. & C. Ry. Co.	Arrive.	Depart.
Akron, Col. & Cin. "Flyer"	5 40 p m	8 10 a m
Akron, Col. & Cin. Night Express.....	7 00 a m	8 00 p m
Akron, Col. & Zanesv'e Ex...	12 50 p m	1 05 p m
Akron & Orrville Accom.....	9 40 a m	3 25 p m

The 8 p. m. train runs daily. Elegant Pullman palace sleeping cars attached. All other trains daily, except Sunday.

Erie Railway.

Depot, South Water Street and Viaduct.

	Arrive.	Depart.
N. Y. & Pitts. Express.....	‡5 38 a m	*8 25 a m
Fast N. Y. & Pitts. Express	*10 55 a m	*3 00 p m
Mahoning Accommo.....		†6 40 a m
Pittsburgh Express.....	†6 25 p m	
Youngstown Local.....	†8 05 a m	
Mahon'g div. & Pitts Local		*11 40 a m
Mahoning Val. Accom.....		†4 30 p m
Pittsburgh Express.....	†1 20 p m	11 10 p m
New York Express.....	*8 00 p m	.....

*Daily. †Daily, except Sunday. ‡Daily except Monday.

Cleveland & Canton Railroad.

(Standard Gauge.)

Depart for—

Zanesville and Coshocton—6:55 a. m., 3:05 p. m.
Canton—6:55 a. m., 3:05 p. m., 6:20 p. m.
Kent—6:55 a. m., *8:50 a m., 3:05 p. m., 6:20 p. m., *8:15 p. m.
Bedford—6:55 a. m., *8:50 a. m., 11:10 a. m., 1:30 p. m., 3:05 p. m., 5:45 p. m., 6:20 p. m., *8:15 p. m.
Newburgh—6:10 a. m., 6:55 a. m., *8:50 a. m., 11:10 a. m., 1.30 p. m., 3:05 p. m., 4:40 p. m., 5:45 p. m., 6:20 p. m., *8:15 p. m.
Canton and intermediate stations (Sundays only), 8:00 a. m., 4:20 p. m.

Arrive from—

Zanesville and Coshocton—10:25 a. m., 6:30 p. m.
Canton, 10:25 a. m., 2:35 p. m., 6:30 p. m.
Kent—*7:45 a. m., 10:25 a. m., 2:35 p. m., 6:30 p. m., *7:10 p. m.
Bedford—6:00 a. m., *7:45 a. m., 10:25 a. m., 1:05 p. m., 2:35 p.m., 4:15 p. m., 6:30 p.m., *7:10 p.m.
Newburgh—6:00 a. m., 7:10 a. m., *7:45 a. m., 10:25 a. m., 1.05 a. m., 2:35 p. m., 4:15 p. m., 5:35 p. m., 6:30 p. m., *7:10 p. m.
Canton and intermediate stations (Sundays only), 9:50 a. m., 6:10 p. m.
Trains marked * run daily.

Valley Railway.

FOR AKRON, CANTON AND MARIETTA.

Depot foot South Water Street.

	Depart.	Arrive.
Valley Junction Mail.....	*7 40 a m	*6 20 p m
Marietta Express.....	†11 15 a m	†2 20 p m
Valley Junction Express...	*4 15 p m	*10 15 a m
Cleve. and Canton Express	*7 00 p m	†8 10 a m

*Daily. †Daily, except Sunday.

WM. THORNBURGH, Gen. Manager. R. A. CARRAN, Gen. Pass. Agt.

Cleveland, Lorain and Wheeling.

All trains arrive and leave the Union Depot as follows:

	Depart.	Arrive.
Wheeling Express.....	6 45 a m	6 55 p m
Uhrichsville Express.....	4 00 p m	9 20 a m

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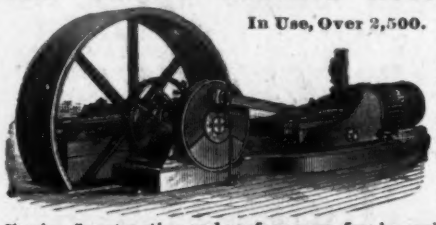

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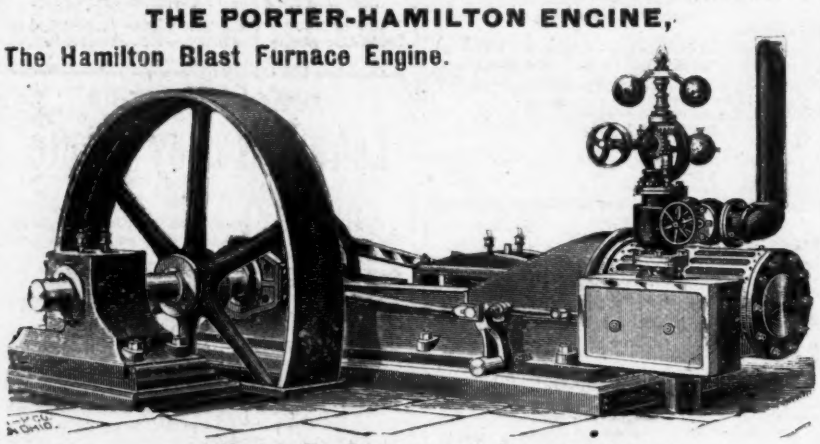

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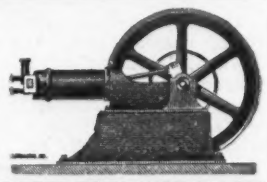

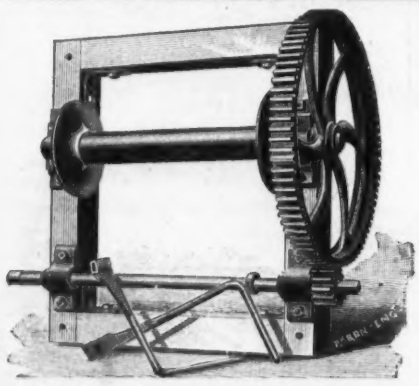

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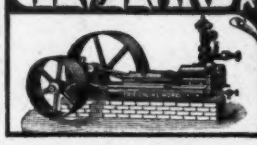

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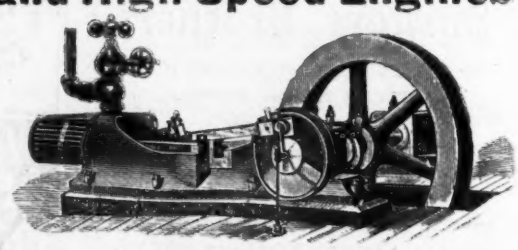

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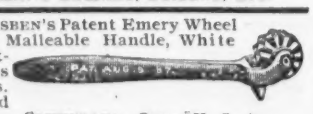

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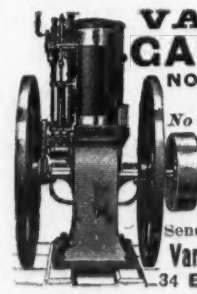

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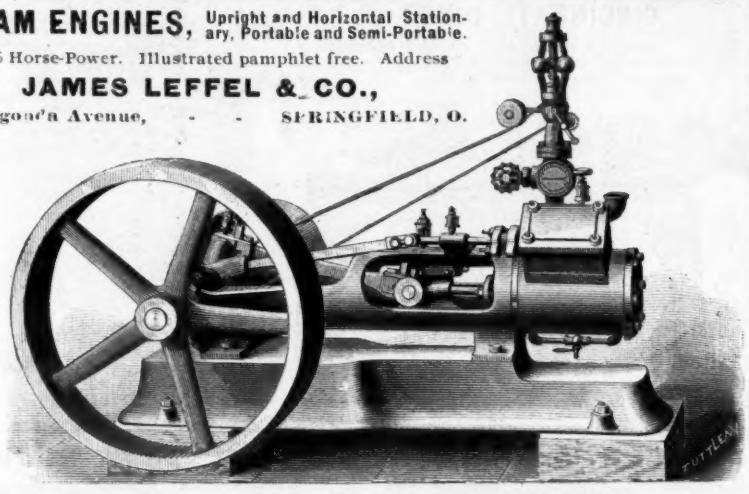

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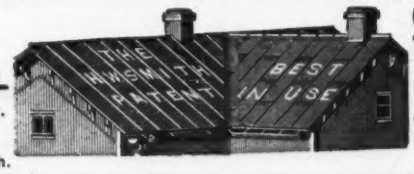

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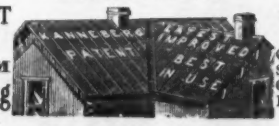

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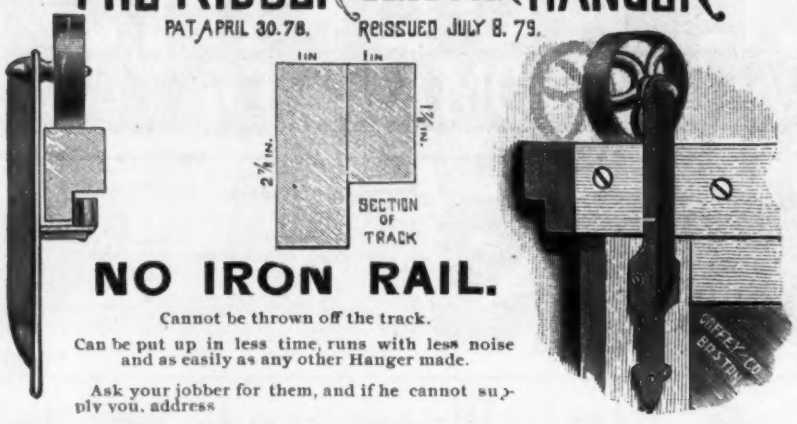

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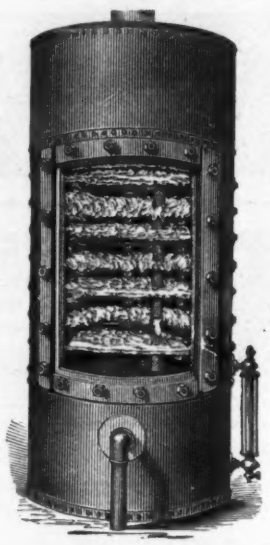

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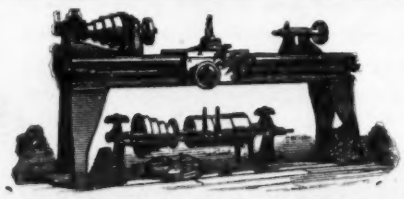

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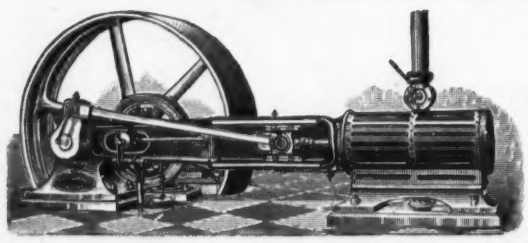

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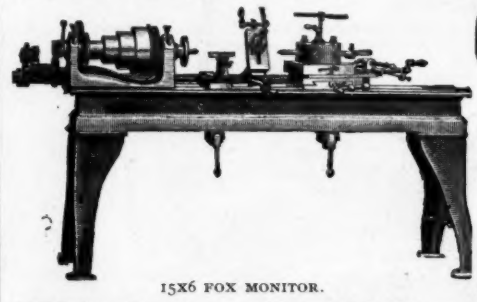

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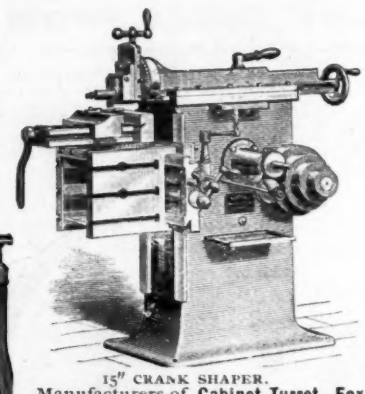

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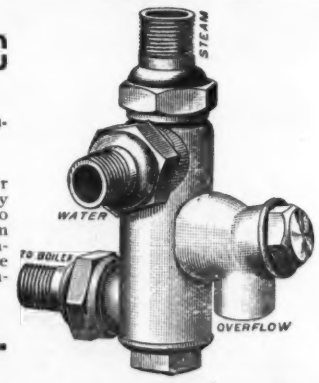

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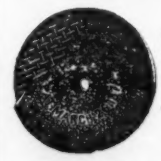

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